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COPPER MANUAL.

COPPER MINES, COPPER STATISTICS

AND

A SUMMARY OF INFORMATION ON COPPER

BY

D. HOUSTON & CO.,
METAL BROKERS,
New York.

1897

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INTRODUCTION.

IN the publication of a work treating on Copper, and its allied interests, we are aware that the utmost care and diligence, coupled with thorough knowledge of the subject, are absolute prerequisites in order to present a satisfactory and reliable statement of the various phases and facts connected therewith.

Accordingly, we have faithfully endeavored in the pages of this "COPPER MANUAL" to meet the requirements sought to be attained; and we hope and trust it will be received not only as a handbook of reference, but of interest and value as well.

D. HOUSTON & CO.

D. HOUSTON.
R. J. HOUSTON.

NEW YORK, December, 1897.

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Synopsis on Copper.

Copper was well known to the ancients, and its discovery and use dates back to the antediluvian period of the world. In tracing the history of copper from the beginning, it is certain that Tubal-cain was the first worker in brass—"an instructor of every artificer in brass and iron." Sacred history, in poetic language, records the fact that "brass (*copper*) is molten out of the stone." In many instances, according to the best authorities, where the word *brass* occurs in Biblical history, a more correct translation would be *copper*. Records show that in the fourth dynasty Cheops worked a copper mine in the peninsula of Sinai. The ancient Greeks engaged in copper mining in the mountains of Cyprus, and it is from this large island in the Mediterranean that this metal derives its name. Cyprian brass was a noted production of this island. The hills of Palestine also yielded copper, and tin being well known to the ancients, there exists authentic proof that the process of mixing alloys and making bronze was understood early in the world's history.

The Syrians and Phœnicians, as also the Greeks and Romans, were remarkably skillful in the manufacture of monuments and statues of bronze, and were able to produce large castings of this metal. It is evident that the early inhabitants of the earth had considerable knowledge of metallurgy, and also possessed methods and processes for hardening metals whereby they could produce keen-edged tools of great hardness, which rendered them capable of cutting the huge blocks of granite for which the Egyptians were famous. Zinc is not mentioned as early as other metals, and as the art of making armor and other implements attained a high degree of perfection at a very early period, some other alloy was employed by the Egyptians as a mixture with copper. Specimens of zinc first appeared about the commencement of the Christian era. Some of the early methods and processes for hardening and toughening metals are perhaps now lost to the world. History fails to give much information regarding the working of copper mines, and the use of the metal during the middle ages.

The wonderful utility attached to copper, rendering it susceptible of various manipulations owing to the possession of the qualities of ductility, durability and malleability, entitles it to rank as one of the most useful and necessary agents in promoting and developing the onward progress of civilization. Copper has played an important part in the sphere of mechanical and scientific development, and has contributed largely to the material welfare and comfort of mankind. The use of the metal is closely interwoven with the history of every advanced nation, and it would be impossible to separate this valuable and useful article from its intimate association and connection in the gradual unfolding of those events which have resulted in the superior physical advantages enjoyed in this day. The multiplicity of uses for which it is adapted, either by itself or in combination with other substances, entitles it to a foremost place in the field of mechanics, art and science.

In our day copper is pre-eminently the electricians' metal, without which the wonderful inventions and discoveries in the field of electric science could not have been perfected, and brought to their present stage of successful practical and commercial achievement. It can be cast into forms of huge dimensions, and spun out into silk-like threads of the finest wire. Possessed of properties adapted to stand the most severe tensile strain and torsel test, it admirably fulfills the requirements demanded, which in many cases must conform to a high degree of scientific accuracy. In a word, it is a metal of rare excellence; sufficient and efficient, for many purposes, and in the future, as in the past, will undoubtedly be distinguished as a factor of great importance towards reaching a still higher development in progressive civilization and scientific attainment.

The mining of copper in this country has an interesting although somewhat checkered history. Extensive excavations discovered long ago at Lake Superior testify to the fact that the search for and mining of copper had engaged the attention of some race of people hundreds of years ago, whose identity remains a mystery to this day. They could not have been Indians, as various implements and utensils found in these ancient diggings show that they were a race excelling the red man in skill. About two hundred years ago it was known that masses of native copper existed in Michigan, but the mineral wealth of that district was destined to remain dormant and undeveloped for many a long year after. Some attempt, however, was made in New England, about two hundred years ago, to mine and smelt copper, and at a later period deposits of copper were found in the State of New Jersey, but the efforts to permanently establish successfully the mining and treatment of copper in those places resulted in failure. The industry did not attain any great magnitude then, and the promoters of those enterprises did not realize any great financial benefits from them. The methods employed in those early days were primitive, and the machinery of crude pattern and limited efficiency, compared with the superbly modeled machinery, and scientifically accurate appliances which constitute the equipment of every great copper mine in our day. The transformation in methods and equipment has been wonderful, and the results achieved proportionately magnificent.

The science of mining has advanced by a series of evolutions, until it has arrived at a very high degree of perfection, making it possible to sink shafts through solid rock 5,000 feet deep with a delicacy of precision adjusted to the nicety of mathematical accuracy, and a facility of operation that is truly akin to the marvelous in the feats accomplished. The splendidly equipped copper mines of this country are an illustration of what great progress has been made in the art of skillful and scientific mining. They are a magnificent monument to the fertile brains and resourceful energy of American genius, representing as they do the application of the very best methods discovered up to date. The copper-mining industry of the United States has grown to gigantic proportions, and can point to the finest mining plants and the most extensive refineries in the world. The industry represents an invested capital of many millions of dollars, and is one of the most successful industries in operation, giving employment to many thousands of persons, and from its earnings disbursing in dividends over $10,000,000 annually. The aggregate copper production of this country last year had a commercial value of $48,698,267.

Dismissing the general consideration of the subject, we would state that the year 1845 marks the dawn of a new and prosperous epoch in the history of copper mining in this country. It was in that year that the first Lake Superior copper found its way to market, and the initial shipment from that district was twelve tons. Modern copper mining in its incipient stage was begun that year in the State of Michigan, and has continued ever since without interruption. It has made wonderful progress year after year, until the Lake Superior district is world-renowned for the richness and extent of its copper deposits, and the unequaled purity and ductility of its copper product. The State Geologist, Dr. Douglass Houghton, made his first report in the year 1841 on the character of the copper deposits in the Northern peninsula, and that was the first official information given to the world by a scientific authority regarding the rich mineral deposits contained in the State of Michigan. This news was soon heralded abroad, and swarms of prospectors and speculators invaded the copper district some time afterwards, all eager to explore for the coveted metal. The mining fever spread rapidly, and there were numerous applications for grants of mineral lands, where there was reason to expect that the hidden treasure lay in stratified veins and rich lodes ready to reward the perseverance of those who might prove successful in finding the prize and tearing it from the tight clasp of mother earth, in whose embrace it had been tenaciously held since creation's morn in undisturbed security. But the time had arrived when the great mineral wealth of this district must yield itself up to the persistent spirit of exploration in man, even though it had lain long buried many fathoms deep in its, hitherto, unpenetrated rocky recesses.

Initial mining operations and explorations were begun at Lake Superior under permits or grants issued by the United States War Department. Out of about 1,000 grants issued 960 locations were made, the stipulation being that the lessee, or his assigns, should pay the Government six per cent. of all metal produced for three years, and ten per cent. for an additional three years; further renewal was to be on the same terms, unless Congress should otherwise dispose of the leased territory. The rich vein in the Cliff Mine was discovered in 1845, and at this mine in the same year was found the first mass of native copper. Great importance was attached to this discovery, and it was followed by other discoveries of large masses of copper which stimulated investments and more active exploration work in that region. The vein found in the Cliff Mine was amygdaloid trap, and yielded a remarkable amount of mass copper, besides a considerable quantity of stamp rock. This pioneer mine was successful from the start, and it may be interesting to introduce a few points in its history, without attempting to go into the various details which mark the operation of this particular property. During seven years, from 1846, sinking was done to a depth of 462 feet, and the openings took in a range of 1,200 feet. The copper taken out during this period realized the sum of $1,328,406.83, and the mine earned net profits of $20,000 per month. Many large masses of copper were found in the Cliff Mine, requiring unusually heavy blasts to dislodge them. At the seventh level a mass was encountered measuring 80 feet in length and 20 feet in breadth. In the early history of mining at Lake Superior the Cliff exceeded any other known mine for the richness of its product. The Minnesota was another very rich mine in mass copper at Lake Superior, whose career began shortly after the Cliff's, but the first place for productiveness belonged to the Cliff.

Shares of the Cliff Mining Company, upon which assessments amounting to $18.50 per share had been paid in, were quoted in the Boston market, June, 1854, at $175 each, and four years later at about $300. In the early days when most of the product from the Lake mines consisted of mass copper, stamp mills were not so necessary as now, and they bore no comparison to the present modern ones. In 1857 the production of the Cliff Mine was 2,363,860 pounds of refined copper, and that proved to be its maximum output. The next year there was a slight reduction, and in 1859 the product had decreased to 1,415,007 pounds. Considerable increase in production over the latter figures was shown in subsequent years, but new explorations on the property proved unsatisfactory, and this once celebrated mine ceased to produce. Work was stopped in 1870, and in 1871 the mine was sold for $100,000. In 1872 a reorganization was effected and work again resumed. Up to 1880 considerable copper was taken out, but returns of production ceased in 1886, when the output for that year had dwindled to 22,342 pounds. From 1848 to 1870 the Cliff Mine paid the expenses of the company, and disbursed among the stockholders the sum of $2,627,660, or slightly over 2,000 per cent. on the paid-in capital. The success of this early mine encouraged other similar enterprises, and new mines were opened up, and entered the lists among copper producers. Several of these mines are now known only as reminiscences of former halcyon days, while those mines upon which the justly celebrated reputation of Lake Superior depends, as a leading source of copper supply, are treated under separate captions elsewhere in this work. Lake Superior copper is undeniably the purest and finest to be found anywhere throughout the world and commands the highest price in the market. The aggregate production of copper from Lake Superior mines from 1882 to 1896 inclusive, amounts to 1,428,381,338 pounds fine copper—being, on an average, over 102,000,000 pounds per annum.

The three great copper districts of the United States are Lake Superior, Montana and Arizona. These three sources of supply furnished about 95 per cent. of the total United States copper production last year. Until the year 1887 Lake Superior was the chief source of American copper supply, but since that year Montana has been the largest producer of copper, and has maintained its supremacy in this respect ever since. In the year 1880 the State of Montana began to attract attention by its copper deposits. The remarkable extent of the argentiferous copper veins, and the prolific character of the mines in Montana, have given this State the distinction of turning out more copper annually than any other district in the world. Montana has gold mines and silver mines, and its output of these precious metals is very considerable, as noted elsewhere in this work, but the copper product of that State for 1896 possessed a commercial value far in excess of the gold and silver produced.

The copper mines of Montana are situated in Silver Bow County near Butte City. The facilities for transportation are excellent, and water and fuel are in abundant supply. The smelting establishments and refineries of the Anaconda, and Boston and Montana Companies are particularly worthy of note, for their extent and splendid equipment. The development of the Montana copper mines has been wonderfully rapid, and their productiveness is without a parallel. In 1882 the copper production of the entire State was 9,058,284 pounds, but in 1896 it had risen to 232,096,483 pounds, which is more than half the total United States production for last year. The auriferous and argentiferous metals also found in the Montana copper mines greatly lessen the cost of the copper product. The copper mines of Montana have brought into existence a great system of metallurgical operations in which many mechanical calciners, reverberatory furnaces, refineries, cupolas, Bessemer converters, and electrolytic works are all employed in preparing the metal for the market. From 1882 to 1896 inclusive, the total production of copper in Montana amounted to 1,636,767,966 pounds fine. During the past seven years the aggregate quantity was 1,159,722,708 pounds.

Arizona is also a very important centre of copper supply, and the developments have been carried on so energetically as to give a total production for 1896 of 72,934,927 pounds. This is slightly more than equal to the Lake Superior production for the year 1885. Arizona copper is of excellent quality, and has won a well-merited reputation for its purity. Explorations in this Western Territory reveal great mineral wealth. Rich bodies of carbonates and oxides preponderate, and the fusibility of the ore makes the smelting process a comparatively easy one. Sulphurets are also found, and oxides and sulphides occur side by side. In some of the workings solid bodies of ore have been encountered of great size, assaying as high as 43 per cent. copper. Arizona is rapidly coming to the front as a copper producer, and during the past six years the output has more than doubled. From 1882 to 1896 inclusive, the aggregate copper production of Arizona amounted to 510,473,336 pounds fine. All other sources of supply in the United States, outside of the three before mentioned, produced in 1896 only 21,684,255 pounds.

From revised and corrected estimates we compute the total United States copper production from the year 1845 to 1896 inclusive, to aggregate the enormous quantity of **$2{,}051{,}740\frac{1315}{2240}$ tons,** or **4,595,898,915 pounds** of fine copper.

The world's copper production for 1896 is estimated at 373,208 tons, of which the United States produced about 55 per cent. The largest foreign producer of copper at present is Spain, with an output of 45,000 tons last year. Chili ranks second among foreign producers, with a production of 23,500 tons in 1896. Japan holds third place, having an output last year to its credit of 21,000 tons. Germany, with a production in 1896 of 20,065 tons, is next in importance as a producer of copper. Mexico, Australia, Africa, Portugal, Russia and Italy follow in about the order named. During the last ten years Mexico has increased its production of copper from about 2,000 tons to 11,150 tons. Japan has a little more than doubled its copper output the past dozen years. Chili's annual copper production has decreased about 15,000 tons since 1885, so that country is no longer the principal source of supply for Europe as formerly. In 1830 Chili produced only 200 tons of copper, but in 1840 the quantity increased to 9,000 tons, and in 1855 to 20,250 tons. The banner year for Chili was in 1869, when her exports of copper amounted to 54,867 tons.

Returns of copper production in Great Britain show only 500 tons for the year 1896; this is in striking contrast to the output obtained years ago from her once prosperous mines. In 1856–57 the number of mines in Great Britain was stated at about 136, most of which were in Cornwall and Devon; and at that time the value of her copper product from British mines exceeded that of all other countries. As early as 1250 England was producing copper from her mines near Keswick, and more than 400 years ago the business had attained considerable importance. It is more than 125 years ago, however, since the Cornwall mines were operated on a large scale for copper. The copper production of Great Britain in the year 1800 amounted to 5,187 tons, and in 1834 to 11,224 tons; the price of copper at the latter date being about £79 per ton, a decline in 35 years of £49 per ton. In 1830 Great Britain produced over one-half of the world's entire copper output.

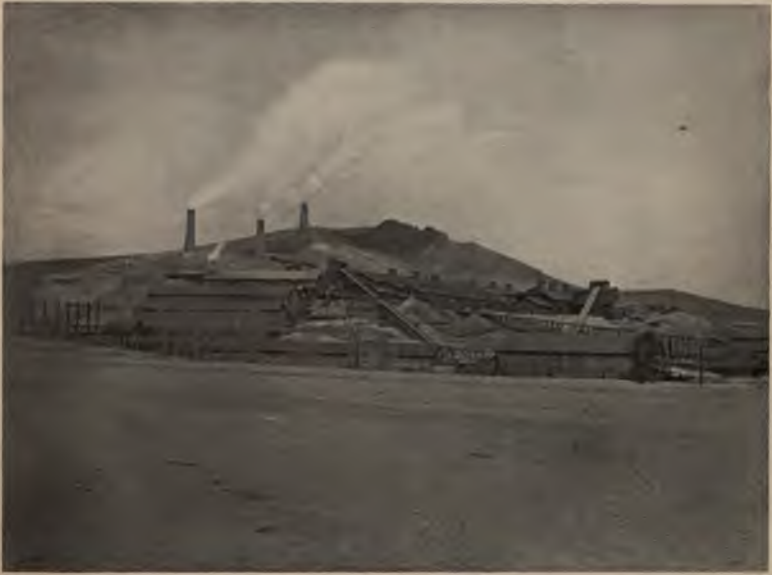
Although British production of copper is now almost next to nil, the imports of copper into England and Swansea have increased in volume and the business is one of great importance in that country. The London copper market is the centre of great activity, where public trading is conducted on a large scale, amounting to between two and three hundred thousand tons annually, in addition to numerous large private transactions put through. The London Metal Exchange is now the chief speculative arena for operations in copper, where potent influences affecting the article are quickly reflected in the frequency of the fluctuations there recorded. The copper supplies of the world come from widely scattered quarters of the globe, and although a full score of countries are engaged in the copper-mining industry, the United States has far outstripped all competitors in the production of this metal, and her copper mines are the richest and most productive ever known in any age.

United States Copper Production.

United States copper production, for a period of 52 years, was as follows, compiled from Government figures:

Year.	Quantity—Lbs.	Year.	Quantity—Lbs.
1845	224,000	1871	29,120,000
1846	336,000	1872	28,000,000
1847	672,000	1873	34,720,000
1848	1,120,000	1874	39,200,000
1849	1,568,000	1875	40,320,000
1850	1,456,000	1876	42,560,000
1851	2,016,000	1877	47,040,000
1852	2,464,000	1878	48,160,000
1853	4,480,000	1879	51,520,000
1854	5,040,000	1880	60,480,000
1855	6,720,000	1881	71,680,000
1856	8,960,000	1882	90,646,080
1857	10,752,000	1883	115,525,760
1858	12,320,000	1884	144,945,920
1859	14,112,000	1885	165,876,480
1860	16,128,000	1886	161,235,381
1861	16,800,000	1887	185,227,331
1862	20,160,000	1888	231,270,622
1863	19,040,000	1889	231,246,214
1864	17,920,000	1890	265,115,133
1865	19,040,000	1891	295,812,076
1866	19,936,000	1892	352,971,744
1867	22,400,000	1893	339,785,972
1868	25,984,000	1894	364,866,808
1869	28,000,000	1895	392,639,964
1870	28,224,000	1896	460,061,430
Total 26 years	305,872,000	Total 26 years	4,290,026,915

Total 52 years, 4,595,898,915 lbs.



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Anaconda Copper Mining Company.

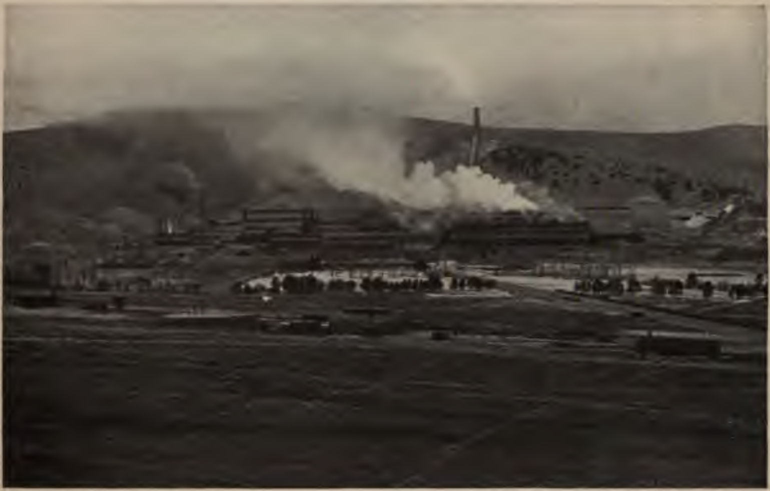
The group of mines operated by this company are located at Butte, Montana, and produce more copper annually than any other single interest in the world. Work was first commenced about 1880 for the production of silver, and preparations made to develop the property as a silver mine, but rich copper ground was struck before the main shaft reached the 400-foot level, and the Anaconda has turned out to be a property of surpassing richness in both silver and copper bearing ores. Since then these great mines have been systematically operated year after year with remarkable results. Silver Bow County, where the copper mines of Montana are situate, is the smallest county in area in the State, but it is the greatest mining centre in the world.

The Anaconda Company owns numerous mining claims, but the principal mines operated under its management are the following, viz.: Anaconda, St. Lawrence, Never Sweat, The South Lode, Ground Squirrel, Green Mountain, Mountain Consolidated, Wake-Up-Jim, Bell, High Ore No. 2, Modoc, and Mat. The Anaconda and Never Sweat join each other, and the Never Sweat is a comparatively new mine, having been opened up since the end of 1894. The main shaft in the Anaconda is three-compartment, about 1,300 feet deep, timbered with square sets and 10x10 timbers. The Anaconda lode gave a large increase in yield last year, and ore is found in every level from the top down. The lodes usually run east to west, and the ledge being large, a vast amount of waste is necessary to fill the stopes. Connection on the lode has been made at all the levels in the Anaconda Mine from the 100 to 1,000 foot level, with both the St. Lawrence and Never Sweat.

The St. Lawrence adjoins the Anaconda on the east, and here No. 1 shaft is now down below the 1,400 foot level. Some time ago this mine received a thorough overhauling, and the plant put in first-class working order. New machinery was also added during the past twelve months, and the equipment brought to a higher stage of efficiency. There are three shafts at the St. Lawrence; the main shaft being a three-compartment, timbered with square sets. As depth is increased great improvement is noted in the lower levels.

At the other mines new hoisting engines and other machinery have been recently installed, and preparations made for maintaining, if not surpassing, previous records. The management expects that with some few additions of air compressors and small machinery, the present equipment is sufficient to carry the operations of the mines 800 feet deeper. The veins vary in dimension from a few inches up to a hundred feet or more, and recent development work has shown up new bodies of ore of a promising character. These mines have been developed in some instances to a depth of 1,400 feet, and have produced, since operations began, 8,154,954 tons of ore, yielding 977,506,000 pounds of fine copper, 35,584,067 fine ounces of silver, and 118,634 fine ounces of gold. The reserves of ore fairly in sight, when the mines were under expert examination previously to the purchase by foreign investors of close to a one-half interest in the property, was very conservatively estimated to be 3,000,000 tons. In the opinion of these experts the extent of productive mining ground indicated a long life to the property even with production on a gigantic scale. Marcus Daly, Superintendent, also states that during the year ending June 30, 1897, there certainly has been no diminution in the reserves of ore in the mines, but on the contrary, in his opinion, there has been a considerable gain.

The Reduction Works are located at Anaconda, about 27 miles from Butte, where a town of considerable size and importance has been built up through the establishment of the great Anaconda copper plant. The ore is brought from the mines over a railway controlled by the



SMELTER OF THE ANACONDA COPPER MINING CO.

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company, and subjected for treatment into pig and electrolytic copper. The quantity of ore received at the Reduction Works during the year ending June 30, 1897, averaged 3,903 tons per diem. Steam stamps of enormous crushing capacity crush the ore preparatory to smelting and refining. The matte from the reverberatories contains from 60 to 70 ounces of silver, and is afterward converted into Bessemer pig of about 99 per cent. copper, and 100 to 120 ounces of silver per ton. The shipments from Anaconda for the year ending June 30, 1897, amounted to 69,377,421 pounds in the form of converter bars, and 62,986,777 pounds of electrolytic copper. There are two sets of works, as a safeguard in case of fire. Their united capacity for producing pig copper is 5,000 tons per month, or over. A new Electrolytic Refining Plant was built over a year ago, which has a capacity of 6,000,000 pounds of refined copper per month if operated to its full limit. The Anaconda's pay-roll averages about $274,297 per month, and the single item of candles for use in the mines requires over $51,000 annually. For coal and charcoal $145,000 a year is expended, and $104,211 in powder, but the latter is not wasted in smoke. The timber necessary last fiscal year cost $488,333.73.

The Anaconda Company has other important subsidiary interests which it operates in connection with the mining and refining of copper. These consist of coal mines, extensive foundry and machine shops, a fine hotel at Anaconda valued at over $100,000, an electric lighting plant and tramway, a water supply company, fire-brick and clay plants, a large timber estate with sawmills attached, stores, real estate, etc., the whole possessing an estimated value of over $5,000,000; besides owning 51 per cent. of the capital stock of the Butte, Anaconda & Pacific Railway Co. The company therefore produces most of its supplies, and reaps the benefit thereof. Probably from $15,500,000 to $20,000,000 has been expended upon the property for construction and subsidiary interests. The Anaconda Copper Mining Company is therefore a concern of gigantic magnitude, with estimated assets of $38,694,379.36, and a capital stock of $30,000,000, divided into 1,200,000 shares of $25 each. The company began paying dividends of ten per cent. per annum on this amount May 1, 1896, and since that date to June 30, 1897, has paid to stockholders the sum of $3,750,000. The profit for the past fiscal year amounts to $5,136,048, against a profit of $4,258,514.70 for the previous fiscal year. President J. B. Haggin states that the costs of refining will be considerably smaller for 1897–8.

The production of the Anaconda Company for the two last calendar years, as furnished us by the company, was as follows:

	1896.	1895.
Fine copper	125,350,693 lbs.	99,775,294 lbs.
Silver	5,433,826.747 fine ozs.	5,470,860.820 fine ozs.
Gold	17,411.3334 fine ozs.	20,229.4498 fine ozs.

PRODUCTION OF ANACONDA AND SYNDICATE MINES.

BASED UPON ANACONDA ASSAYS AND WEIGHTS.

PERIOD.	Tons of Dry Ore sent to Reduction Works.	SHIPMENTS FROM ANACONDA.		
		Copper. Tons of 2,000 Lbs.	Silver. Fine Ozs.	Gold. Fine Ozs.
Approximate shipments of ore sold before 1884	38,410	16,500		
In 1884	30,347	1,943		
In 1885	227,447	20,231		
In 1886	193,535	16,429		
In 1887	359,553	29,621		
In 1888	455,130	33,553		
In 1889	488,328	30,905		
First four months 1890	189,126	12,749		
	1,981,876	161,931	7,000,000*	
May 1, 1890 to Feb. 1, 1891	427,751	23,725	1,581,363	5,412
Feb. 1, 1891 to Oct. 27, 1891	115,346	12,417	856,423	2,700
Oct. 27, 1891 to Dec. 31, 1892	1,037,910	55,955	3,766,949	16,182
In 1893	569,478	40,723	3,466,766	22,072
In 1894	836,528	49,340	4,869,374	22,956
First six months 1895	484,160	24,962	2,798,400	10,632
Year 1895-6	1,276,156	58,518	5,308,955	18,300
Year 1896-7	1,425,749	66,182	5,935,837	20,380
	8,154,954	488,753	35,584,067	118,634

*NOTES.—Prior to 1890 the given quantity of 7,000,000 ozs. of silver is only a very rough approximation. In these years very little was received for the gold contents of the matte then shipped.

The mines were first worked, commencing in about 1880, for silver, yielding a product of a few hundred thousand ounces of that metal, which is not included in above statement.

In the statement of tons of ore reduced is included "custom ores," but most of ore so bought came from tributors working in some of the Anaconda Mines.

ANACONDA COPPER

PROFIT AND LOSS ACCOUNT

Year Ending 30th June, 1896.			
$ 748,294 01	To Copper, Silver and Gold on hand 1st July, 1896..		$ 4,888,020 26
$ 5,071,677 61	Mining—all expenditures......	$ 5,725,999 93	
5,616,516 78	Reduction Works—all expenditures......................	5,812,517 60	
$10,688,194 39		$11,538,517 53	
829,485 89	Deduct Profits on Operations of Subsidiary Departments.....	556,505 08	
$ 9,858,708 50			10,982,012 45
586,922 15	Freights—Railway and Ocean................		681,692 57
1,248,214 29	Refining Charges on Seaboard................		1,058,824 93
135,974 81	Interest on Advances..........................		116,115 83
	General Expenses—		
46,350 89	Anaconda.............................		*
62,718 56	New York..............		77,679 31
4,258,514 70	Balance, being Profit for the year...........		5,136,048 00
$16,945,697 91			$22,940,393 35

*NOTE.—These expenses are included this year under Mining and Reduction Works Expenses.

MINING COMPANY.

YEAR ENDING 30TH JUNE, 1897.

Year Ending 30th June, 1896.			
	By Sales:		
$ 8,578,177 29	Copper, 120,864,097 lbs.....	$13,003,955 10	
3,055,184 41	Silver, 6,057,067 ozs. fine....	3,881,551 75	
296,542 29	Gold, 18,511 ozs. fine.......	382,259 70	
$11,929,903 99			$17,267,766 55
127,773 66	Royalties, Rents and Dividends...............		151,595 32
4,888,020 26	Copper, Silver and Gold on hand, 30th June, 1897.......................................		5,521,031 48
$16,945,697 91			$22,940,393 35

The officials of the Anaconda Copper Mining Company are as follows:

Trustees:

J. B. HAGGIN, President.
H. B. PARSONS, Vice-President.
L. T. HAGGIN.
R. P. LOUNSBERY.
MORRIS LOEB.
HAMILTON SMITH.
L. A. HEINSHEIMER.

Secretary:

F. E. SARGEANT, Anaconda.

Assistant Secretary:

H. ESK-MOLLER, New York.

Superintendent:

MARCUS DALY, Anaconda.

Offices:

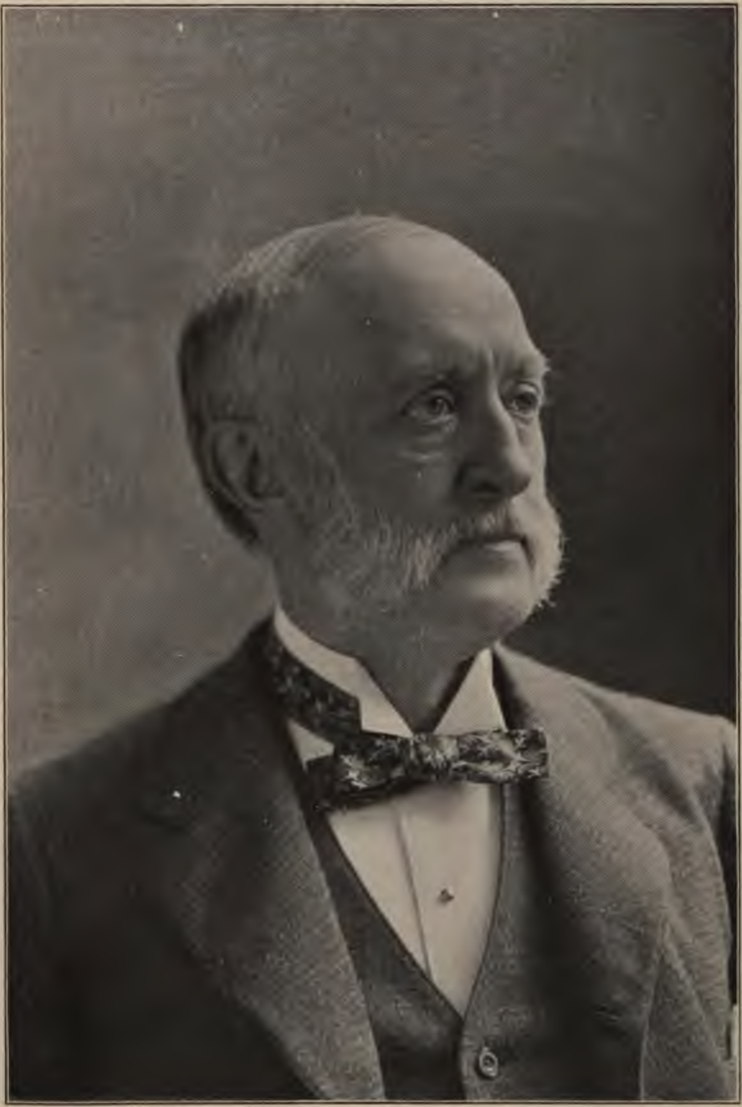
ANACONDA, MONTANA.
BUTTE, MONTANA.
15 BROAD STREET, NEW YORK.

European Agents:

THE EXPLORATION COMPANY, LIMITED,
11 Cornhill, London, E. C.

Auditors:

JONES, CAESAR & COMPANY,
New York and Chicago.



JOHN STANTON.

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MONTHLY COPPER PRODUCTION OF THE ANACONDA COPPER MINING COMPANY FOR 1896.

1896.	Refined Copper, Lbs.
January	7,945,510
February	12,398,467
March	11,300,044
April	11,049,874
May	9,962,493
June	9,109,558
July	9,899,825
August	10,617,500
September	10,423,291
October	11,309,040
November	9,618,895
December	10,915,881
Total 12 months	124,549,878

1897.	Refined Copper, Lbs.
January	11,012,130
February	9,998,063
March	11,017,242
April	10,947,488
May	12,262,501
Total first 5 months 1897	55,237,424

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MONTHLY COPPER PRODUCTION OF THE ANACONDA COPPER MINING COMPANY FOR 1896.

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September	10,423,291
October	11,309,040
November	9,618,895
December	10,915,881
Total 12 months	124,549,878

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January	11,012,130
February	9,998,063
March	11,017,242
April	10,947,488
May	12,262,501
Total first 5 months 1897	55,237,424

the removal of the smelting operations from Butte in 1893, the output of the mines is treated at a much less cost, and the product at Great Falls is now in the shape of refined and electrolytic copper. The production of copper in 1896 amounted to about 60,000,000 pounds.

The capital stock of the Boston & Montana is $3,750,000, divided into 150,000 shares of the par value of $25 each. Since August 20, 1888, to November 20, 1897, the company has paid in dividends the total sum of $6,275,000, and at the beginning of this year had a balance of assets amounting to $2,740,328.37. An admirable system of power and transportation facilities, in conjunction with a general economical management of the mining plant, and smelting and electrolytic works, have resulted in lowering the cost of production to a point which has placed the Boston & Montana Company in the front ranks for earning ability.

The company paid in dividends during the year 1896 the sum of $1,500,000, besides adding $1,174,350.19 to its surplus account. The outstanding bonded indebtedness had been reduced to $1,089,000 January 1, 1897, and payments to the sinking fund in 1896 amounted to $150,000. Shares of Boston & Montana stock have had a most remarkable rise in market value, advancing gradually from $15 in 1893 to $152 per share in September, 1897. Construction expenses at mine, and the Great Falls plant, have absorbed $2,700,458.87 since 1887. The real estate owned by the company is valued at $4,282,414.56.

The officials of the Boston & Montana Company are as follows:

President:

A. S. BIGELOW.

Directors:

A. S. BIGELOW,
*THOMAS NELSON,
CHARLES VAN BRUNT,
LEONARD LEWISOHN,
JOSEPH S. BIGELOW,
JOSEPH G. RAY,
FRANK KLEPETKO, of Montana.

Secretary and Treasurer:

*THOMAS NELSON.

Deceased November 19, 1897.

LEONARD LEWISOHN.

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We append the last financial statement issued by the Boston & Montana Company for the calendar year 1896, viz.:

ASSETS AND LIABILITIES.

Assets.

Cash and accounts receivable at Boston, and copper, silver, gold and bluestone sold but not paid for	$2,912,942 70
Cash and accounts receivable at Butte	21,071 07
Supplies on hand at Butte	59,058 38
Cash and accounts receivable at Great Falls	8,069 93
Supplies on hand at Great Falls	127,829 24
Total assets	$3,128,971 32

Liabilities.

Accounts payable at Boston		$53,364 47	
" " Butte		140,484 93	
" " Great Falls		111,608 55	
Accrued interest on bonded debt		20,685 00	
Sinking fund due January 1, 1897	$50,000 00		
Proportion of sinking fund due April 1, 1897	12,500 00		
		62,500 00	
Total liabilities			388,642 95
Balance of assets, December 31, 1896			$2,740,328 37

REPORT OF THE BOSTON & MONTANA CONSOLIDATED COPPER AND SILVER MINING COMPANY.

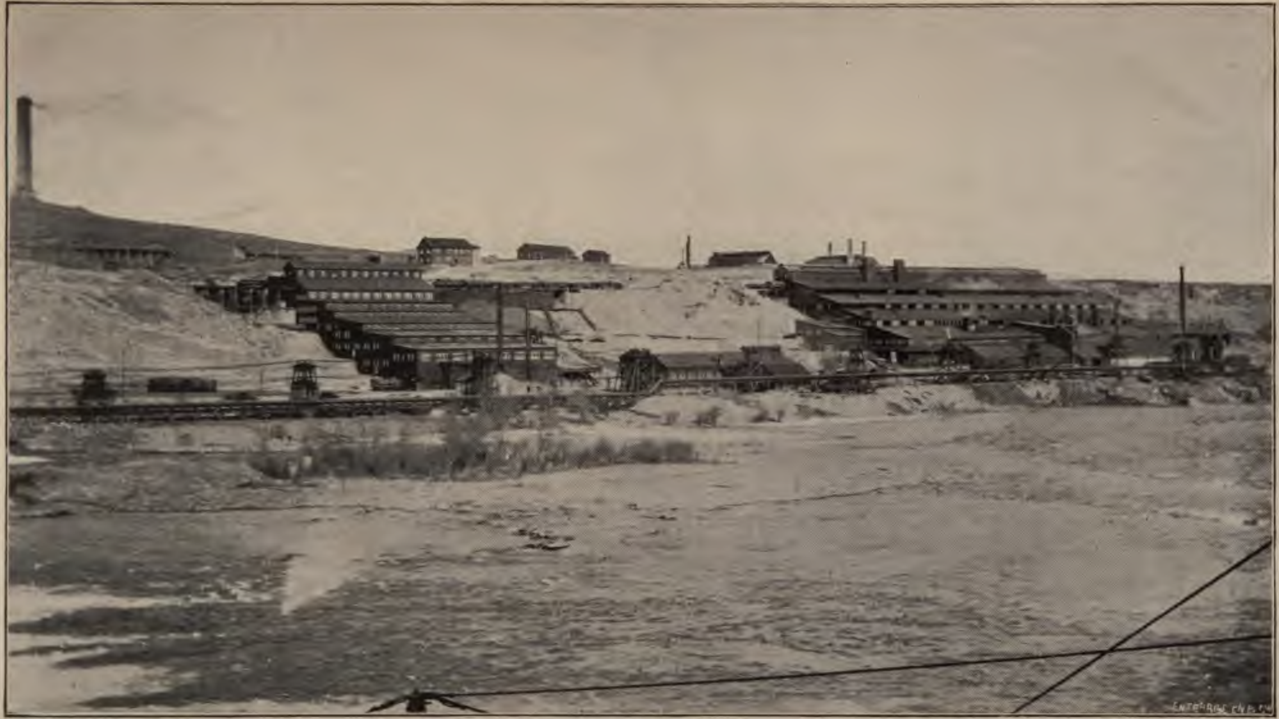
The Directors submit the following report of the operations for the year ending December 31, 1896:

Gross receipts from sales of copper, silver, gold and bluestone			$6,414,307 20
The costs have been—			
Expenses at Butte and Great Falls		$2,887,968 27	
All expenses of handling copper, such as freight, copper charges, commissions, and expense account		646,314 82	
Total expenses			3,534,283 09
			$2,880,024 11
Interest on bonded debt	$79,502 50		
Less interest receipts	23,828 58		
		$55,673 92	
Sinking funds		150,000 00	
			205,673 92
			$2,674,350 19
Dividends Nos. 19, 20, 21, and 22			1,500,000 00
			$1,174,350 19
Balance of assets, December 31, 1895			1,565,978 18
Balance of assets, December 31, 1896			$2,740,328 37

SUMMARY OF BOSTON & MONTANA OPERATIONS.

The following shows the result of operations by the Boston & Montana Consolidated Copper and Silver Mining Co., for the year ending December 31, 1896, compared with the two previous years, viz.:—(cents omitted.)

	1896.	1895.	1894.
Gross receipts	$6,414,307	$4,999,231	$3,630,526
Mine and smelter expenses	2,887,968	2,086,161	2,019,205
Other expenses	646,314	555,365	623,876
Total expenses	3,534,283	2,641,527	2,643,081
Interest	55,673	86,392	122,781
Sinking funds	150,000	150,000	150,000
Net earnings	2,674,350	2,121,311	714,663
Dividends	1,500,000	1,050,000	300,000
Property bought	....	37,769	232,401
Surplus for year	1,174,350	1,033,542	182,262
Total surplus	2,740,328	1.565,978	532,436
Ore reserves, tons	950,000	956,233	885,455
Assets	3,128,971	1,896,004	803,237
Liabilities	388,642	330,026	270.801
Surplus	2,740,328	1,565,978	532,436



SMELTER OF THE BOSTON & MONTANA CONSOLIDATED COPPER AND SILVER MINING COMPANY, GREAT FALLS, MONTANA.

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United States Copper Production.

BY MONTHS.

The following is the United States copper production, as per the official returns of the Copper Producers' Association, since July, 1892, the date when these returns began. The figures include the output of reporting mines, and estimated outside sources, in tons of 2,240 pounds fine copper:

Date, 1892.	Reporting Mines.	Outside Sources. (Estimated.)	Total, Long Tons.
July	9,294	924	10,218
August	10,807	870	11,677
September	9,710	994	10,704
October	9,668	1,289	10,957
November	9,888	1,036	10,924
December	9,872	1,174	11,046
Total 6 months	59,239	6,287	65,526

Date, 1893.	Reporting Mines.	Outside Sources. (Estimated.)	Total, Long Tons.
January	9,187	989	10,176
February	8,213	1,042	9,245
March	9,065	1,321	10,386
April	11,775	1,042	12,817
May	12,706	1,042	13,748
June	11,524	1,042	12,566
July	11,049	1,042	12,091
August	11,745	1,042	12,787
September	11,750	1,042	12,792
October	11,503	1,042	12,545
November	10,705	1,042	11,477
December	10,538	1,042	11,580
Total 12 months	129,760	12,730	142,480

UNITED STATES COPPER PRODUCTION—CONTINUED.

Year [illegible].	Reporting Mines.	Outside Sources Estimated.	Total. Long Tons.
January	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	14,232
November	[illegible]	[illegible]	12,644
December	[illegible]	[illegible]	10,745
Total 12 months	[illegible]	[illegible]	[illegible]

Year [illegible].	Reporting Mines.	Outside Sources Estimated.	Total. Long Tons.
January	10,094	1,600	11,694
February	11,120	1,600	12,720
March	12,553	1,600	14,153
April	11,944	1,600	13,544
May	13,260	1,600	14,860
June	11,641	1,100	12,741
July	12,524	1,100	13,624
August	14,290	1,100	15,390
September	14,251	1,100	15,351
October	15,045	1,100	16,145
November	15,330	1,100	16,430
December	13,445	1,100	14,545
Total 12 months	155,497	15,700	171,197

UNITED STATES COPPER PRODUCTION—CONTINUED.

Date, 1896.	Reporting Mines.	Outside Sources. (Estimated.)	Total, Long Tons.
January	14,872	1,200	16,072
February	16,316	1,200	17,516
March	16,722	1,200	17,922
April	15,912	1,200	17,112
May	15,533	1,200	16,733
June	14,825	1,200	16,025
July	15,395	1,200	16,595
August	15,600	1,200	16,800
September	15,777	1,200	16,977
October	16,958	1,200	18,158
November	15,165	1,200	16,365
December	16,419	1,200	17,619
Total 12 months	189,474	14,400	203,894

Date, 1897.	Reporting Mines.	Outside Sources. (Estimated.)	Total, Long Tons.
January	16,937	700	17,637
February	16,119	700	16,819
March	17,583	700	18,283
April	16,554	900	17,454
May	17,805	1,000	18,805
June	18,653	1,000	19,653
July	14,244	1,100	15,344
August	16,309	1,100	17,409
September	16,343	1,100	17,443
October	16,341	1,200	17,541
Total 10 months	166,888	9,500	176,388

European Copper Production.

The production of copper, by the foreign reporting mines, as per the official figures of the Copper Producers' Association, was as follows, in tons of 2,240 pounds fine:

Date, 1892.	Long Tons.
July	6,358
August	6,888
September	5,478
October	6,476
November	6,789
December	7,666
Total last 6 months	39,655

Date, 1893.	Long Tons.
January	5,736
February	6,762
March	6,896
April	6,913
May	6,806
June	7,935
July	6,095
August	7,057
September	6,303
October	7,081
November	6,953
December	7,248
Total 12 months	81,785

Date, 1894.	Long Tons.
January	8,145
February	7,217
March	6,922
April	7,385
May	8,013
June	7,611
July	6,960
August	7,367
September	7,110
October	7,231
November	6,964
December	7,606
Total 12 months	88,531

EUROPEAN COPPER PRODUCTION—CONTINUED.

Date, 1895.	Long Tons.	Date, 1896.	Long Tons.
January	6,737	January	6,834
February	6,739	February	7,096
March	7,424	March	6,910
April	7,219	April	6,865
May	7,400	May	7,495
June	6,965	June	7,055
July	6,988	July	7,847
August	7,129	August	7,022
September	6,947	September	7,182
October	7,753	October	7,297
November	7,728	November	7,108
December	7,149	December	7,685
Total 12 months	86,178	Total 12 months	86,896

Date, 1897.	Long Tons.
January	6,595
February	7,241
March	8,358
April	7,318
May	7,116
June	7,635
July	7,327
August	6,963
September	7,541
October	7,108
Total first 10 months	73,202

United States Exports of Copper.

Exports of copper from the United States, as per the official returns made by the Copper Producers' Association, were as follows, in tons of 2,240 pounds fine :

Date, 1892.	Long Tons.
July	3,450
August	1,545
September	1,458
October	3,144
November	3,897
December	4,486
Total last 6 months	17,980

Date, 1893.	Long Tons.	Date, 1894.	Long Tons.
January	3,171	January	7,717
February	1,815	February	5,590
March	2,334	March	7,137
April	3,450	April	6,209
May	4,482	May	6,140
June	5,109	June	6,976
July	7,181	July	7,226
August	9,127	August	6,408
September	16,131	September	7,093
October	11,478	October	5,057
November	7,821	November	4,785
December	8,293	December	6,793
Total 12 months	80,392	Total 12 months	77,131

UNITED STATES EXPORTS OF COPPER—CONTINUED.

Date, 1895.	Long Tons.	Date, 1896.	Long Tons.
January	7,144	January	8,168
February	3,450	February	8,296
March	3,914	March	10,892
April	5,677	April	10,684
May	5,430	May	10,481
June	8,600	June	9,797
July	6,035	July	10,885
August	4,493	August	9,119
September	4,106	September	10,898
October	3,773	October	11,371
November	4,874	November	12,034
December	7,226	December	12,980
Total 12 months	64,722	Total 12 months	125,605

Date, 1897.	Long Tons.
January	9,651
February	8,856
March	11,232
April	10,279
May	12,175
June	12,677
July	13,728
August	10,971
September	10,980
October	8,785
Total first 10 months	109,334

The Calumet & Hecla Mining Company.

This is the greatest of the Lake Superior copper mines. Thirty years ago it began the production of copper; its output in the year 1867 amounting to 1,351,173 pounds. When the Calumet & Hecla began its career there were as many as half a dozen larger producers at the Lake, but the rich character of the conglomerate vein found on the Calumet & Hecla property soon placed this mine at the head of all other copper producers, not only in Michigan, but in the United States; and it was not until the Anaconda Mine, in Montana, began the production of copper a few years ago, that this leading Lake Superior mine was compelled to take second place in point of production. Since ground was first opened on this property the Calumet & Hecla has produced 1,176,276,471 pounds of refined copper to May 31, 1897. The output for 1896 was the largest the company ever turned out, and equaled about 63 per cent. of the entire Lake Superior production. Compared with the total United States copper production in 1896, however, the Calumet & Hecla's output last year, large as it was, equaled only 19.6 per cent. of the aggregate copper production of this country. During the decade from 1870 to 1880 the Calumet & Hecla produced 50 to 55 per cent. of all the copper turned out by American mines, with the exception of 1877, when its proportion to the total output of the country was about 48 per cent.

Notwithstanding the great gains in productive capacity made by this company the past 12 to 15 years, they have not been so marked as the increase in the general copper production of this country during the time mentioned. Since 1883 the Calumet & Hecla's production has increased 173 per cent., but the total copper production of the United States has increased 298 per cent. during the same period. During the fiscal year ending April

RED JACKET SHAFT OF CALUMET & HECLA MINING CO.

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30, 1897, this company increased its production 8.1 per cent. compared with the previous fiscal year, and 48 per cent. compared with the fiscal year ending April 30, 1895. The time may not be very far distant when the Calumet & Hecla will produce 100,000,000 pounds of refined copper per annum, if not more. For the first five months of 1897 its average monthly production was 7,801,500 pounds, against an average monthly production in 1896 of 7,538,077 pounds.

The history of the Calumet & Hecla Company furnishes a striking example of successful mining, but even this wonderful mine had its dark days when it was first launched as a mining and financial enterprise. The original promoters connected with its early development had their patience and resources pretty well tested before achieving the well-merited success that eventually crowned their efforts. The copper deposit found in the Calumet & Hecla lode, however, soon made it apparent that the conglomerate vein in the mine was of remarkable richness, and the subsequent development of this famous lode has demonstrated its great extent and value, and laid the foundation for the wonderful success that ensued. With an expenditure of capital stock amounting to $1,200,000 the Calumet & Hecla has returned to stockholders in dividends the enormous total of $50,850,000 up to October 1, 1897, in addition to perfecting an expensive mining plant and making numerous surface improvements of a modern and superior character.

In the year 1865 the stock was held at $1 per share, but after the discovery of the vein, which has proved of such immense value, the stock began to attract more attention, and advanced rapidly until it reached $30 per share. In those early days of its history Calumet & Hecla stock was bought and sold in blocks at $1 per share, and interesting incidents might be related in connection with some of these transactions. Where thousands of shares were parted with at $1 each, in a few months after they were bought back again at $35 per share. In the early stages of operations an assessment of $5 per share was called to develop the newly discovered lode, and as the developments proved highly satisfactory, the market for the shares became more active, and they continued to advance in value, and in a few months reached $75.

Having a large territory the Calumet determined to organize a new company, and in the summer of 1866 the Hecla Company was created. The stock of the Hecla was apportioned to the holders of the Calumet, share for share, at $5 per share, and thus a working capital was provided for the new organization. Before the winter of that year, and previous even to the opening of the new mine, the stock advanced to $75 per share. An assessment of $8 was called on the Hecla, and an additional one of $5 on the Calumet, which caused the stock of the latter to fall to $15 per share. Other assessments were called in February, 1868, of $15 per share on the Calumet, and $25 per share on the Hecla, the market value of the stock then being $30 per share. In December, 1869, Hecla stock had risen to $85, when it paid its first dividend of $5 per share. The Calumet made its first dividend in August, 1870. In May, 1871, the consolidation of the two companies was effected, and the capital stock made $1,000,000, divided into 40,000 shares, together with a stock dividend which increased the shares to 50,000. Up to this time the Hecla had paid $32.50 per share in dividends, and made assessments of $25 per share. The Calumet, previous to the consolidation of the two companies, had called assessments amounting to $15 per share, and the dividends paid previous to the union with the Hecla amounted to $15 per share.

In 1873 the shares were increased to 80,000, and in 1879 they were further increased to 100,000 shares, with a capital stock of $2,500,000, which is the limit of capital allowed by the mining laws of the State of Michigan. Money has been freely expended in the erection of a thorough equipment for continuing production under almost any ordinary contingency. This policy has incurred large expenditures for machinery and plant, but future expenditures for new equipment are expected to be comparatively small.

The new Red Jacket vertical shaft on the company's property has been sunk to a depth of 4,900 feet, beyond which depth sinking will not be pursued. This is about the bottom of the company's property in its widest extent. This shaft was started in the fall of 1889, it is 17 feet by 25 feet with six compartments, and is the largest known. It has passed through and far below the conglomerate lode. The rock temperature at this depth is 87.6 Fahrenheit, a temperature which will not interfere with active mining operations. At the Red Jacket shaft a new large iron shaft-house has been erected, with a capacity nearly equal to that of four other ordinary shaft-houses. The tail house provided for this shaft is 412x32 feet, and the main engine house is 220x70 feet. This hoisting arrangement, it is claimed, can lift a load of ten tons through the shaft at a speed of 60 feet per second. The boiler house will have ten boilers of 1,000 horse-power each. The smokestack is of brick 250 feet high, with an inside diameter of 12½ feet. The Red Jacket shaft is connected with No. 4 shaft, Calumet, at the 36th, 39th and 42d levels, thereby providing another exit from the mine in case of fire. The Calumet & Hecla Mine has 12 shafts, most of them being down to or below the 40th level, and they follow the incline of the lode. The length of all the shafts sunk below the level of the stopes is over two miles, and the length of all the drifts run below the average level of the stopes is $13\frac{6}{10}$ miles.

The conglomerate vein varies in size, but its average width is about 16 feet. The company recently started three shafts on the outcrop of the Osceola amygdaloid, and all of the shafts are now into the lode and show copper. The Osceola amygdaloid crosses the Calumet & Hecla property, and exploratory work may result in developing a new mine upon this vein.

The real estate of the company consists of $2,599\frac{25}{100}$ acres of mineral land in Houghton County, and $20,352\frac{35}{100}$ acres of timber land in Keweenaw, Houghton and Ontonagon Counties. At the stamp mills there are $988\frac{19}{100}$ acres. There are 698 houses belonging to the company, 20 churches and six schools on the company's land. On leased lots employees of the company also own 782 houses at the mine, and 159 at the lake.

The Calumet & Hecla Company has two stamp mills at Torch Lake. There are 24 Leavitt heads with steam cylinders in the two mills, having a capacity of crushing 250 tons each of stamp rock in 24 hours. A triple-expansion pumping engine, with a capacity of 60,000,000 gallons daily, supplies the water for the stamps.

Two smelting establishments treat the company's product. The Torch Lake Smelting Works occupy nearly 30 acres, and are connected by railway with the stamp mills. The Buffalo Smelting Works are at Buffalo, N. Y., and cover $14\frac{1}{10}$ acres. This latter plant includes a building capable of storing from 12,000 to 14,000 tons of mineral, and two refining furnace buildings, each 140 by 88 feet, built of brick with iron roofs. More than half the product has lately been refined at Buffalo. The Calumet & Hecla Company can make cakes as large as 53x53 inches, seven inches thick, and weighing 6,000 pounds each. Shipments of these extra sized cakes have been made to France.

The production of refined copper by the Calumet & Hecla Mining Company for the past six fiscal years, ending April 30, was as follows :

Fiscal Year.	Pounds.
1892	56,495,211
1893	60,427,913
1894	61,324,000
1895	62,466,414
1896	85,552,756
1897	92,475,595

The officers of the company are as follows :

ALEXANDER AGASSIZ, *President.*

T. L. LIVERMORE, *Vice-President.*

Directors :

ALEXANDER AGASSIZ,
T. L. LIVERMORE,
FRANCIS L. HIGGINSON,
FRANCIS HUNNEWELL,
QUINCY A. SHAW, JR.,
JAMES M. WRIGHT.

GEORGE A. FLAGG, *Treasurer.*

CALUMET & HECLA MINING COMPANY.

Statement of Assets and Liabilities.

Assets.

Cash at Mine Office	$ 84,535 56
" " New York Office	15,000 00
" " Boston Office, Exchange, Copper at 8½ cts. per lb., and Mineral at 4 cts. per pound	6,599,427 74
Bills receivable at Boston and Mine	322,442 62
	$7,021,405 92

Liabilities.

Drafts in Transitu	$ 84,353 85	
Employees' Aid Fund	4,535 30	
Bills payable at Boston and Mine	232,305 18	
Machinery Contracts	562,000 00	
Aid Fund, Hospital, Insurance Fund	249,000 00	
		1,132,194 33
Balance		$5,889,211 59

(Signed) GEORGE A. FLAGG, *Treasurer.*

Boston, April 30, 1897.

December 2, 1897. The Calumet & Hecla Mining Co. declared a dividend of $10 per share, payable January 1, 1898. This makes $50 per share, or $5,000,000 this year. Total dividends amount to $51,850,000.

The following is the statement filed by the Calumet & Hecla Co. with the County Clerk, in Michigan, for the year 1896, viz. :

Amount invested in real estate	$7,169,785 63
Amount of personal estate	6,392,083 49
Unsecured or floating debt	1,301,215 01
Amount due corporation	8,866,542 47

MONTHLY COPPER PRODUCTION OF THE CALUMET & HECLA MINING COMPANY FOR 1896.

1896.	Refined Copper, Lbs.
January	7,567,601
February	5,986,102
March	7,851,144
April	7,789,078
May	7,530,812
June	8,376,970
July	8,055,564
August	7,720,416
September	7,250,011
October	7,771,836
November	6,990,489
December	7,566,910
Total 12 months	90,456,933

1897.	Refined Copper, Lbs.
January	7,633,189
February	7,310,326
March	8,343,550
April	7,925,522
May	7,794,916
Total first 5 months 1897	39,007,503

THOMAS F. MASON.

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The Quincy Mining Company.

The history of the Quincy Mine may be said to be the history of copper mining on Lake Superior. The company was organized under a special charter of the State of Michigan March 30, 1848; and reorganized under the Mining Law of the State of Michigan March 6, 1878. Work was commenced on what was called the "Quincy vein," which carried chiefly heavy copper, and which in those early days was the only character of deposits that were thought worthy of mining. From these deposits, called fissure veins, those celebrated old mines, the "Minnesota" in Ontonagon County, and "Cliff" Mine in Keweenaw Point, Michigan, obtained the large masses of native copper that made them famous; but the fissure veins of Lake Superior have long since ceased to produce copper in paying quantities, and the only mine now working on any of these veins is the "Central."

About the year 1857, what is now known as the "Pewabic vein," an amygdaloid belt having been opened on the Quincy property, through the discovery of large ancient "Indian pits," the old Quincy vein proving unprofitable was abandoned, and work concentrated on the "Pewabic vein," which has since been profitably mined. Although this "Pewabic vein" carried a good percentage of heavy copper, it was evident from the first that the chief dependence for dividends must be by making available the lower grade of rock, now called "stamp rock," and to do this a good stamp mill must be built, which, owing to the large quantity of water required for dressing the mineral, was located on the shore of Portage Lake, at a convenient distance for economically delivering the rock from the mine. The old Lake Superior miners looked upon the plant during construction as a piece of extravagance, as nothing so elaborate had before been attempted, and some at the time predicted that the "bats and owls would inhabit all those fine buildings."

The work, although insignificant, compared with present equipment, was nevertheless well planned, and must be considered a success, for it proved that the amygdaloid beds could be worked profitably, and time has shown that they contained the greatest wealth, and can be depended upon to yield mineral to such great depths, that it is not likely that the present generation will live to see them exhausted. But for the success of the Quincy in working these low-grade deposits it is doubtful if the great Calumet & Heĉla Mine would have ever been known, for that was opened on a conglomerate belt, never before considered of value, carried little heavy copper, and so could not obtain a product without a large equipment. The Quincy was made a dividend-paying mine on a paid-up capital of only $200,000. The cost of land and equipment largely exceeded this, but the balance of the money was obtained from the heavy copper which could be made marketable before any stamping facilities had been provided. But in the case of the Calumet & Hecla this could not be done to any extent, and therefore a large capital was required to construct a necessary plant before its product could be made commercially valuable. But for the record the Quincy had made it is doubtful if capitalists could have been found to supply necessary funds to bring that mine to a paying point. Thus the Quincy may also be said to have educated the country up to the value and ways of developing and making profitable the low-grade native copper deposits of Lake Superior.

In 1862 the Quincy Mining Company began the payment of dividends. Total dividends paid up to August 16, 1897, amount to $9,470,000. In 1864 the production was 2,498,574 pounds of ingot copper at a cost of 26.7 cents per pound. From that year's operations the company derived a profit of $452,969.95 and declared dividends amounting to $320,000. In 1867 the cost was reduced to 20 cents per pound, but in 1872 it went up again to 22.93 cents. During 1873, however, the cost was brought down to 18.57 cents, the average price paid for shafts and drifts being less than during the previous year, and the yield of mineral per fathom being 600 pounds, against 482 pounds in 1872. A further reduction in cost of production was made in 1874, to 15.13 cents per pound, and the mineral that year yielded 84.125 per cent. copper. Twenty years after, in 1894, cost had been reduced to 5.68 cents per pound, which is the lowest on record for the Quincy Mine.

The acquisition of the "Pewabic" property in 1891, which adjoins the Quincy Mine on the north, has enabled the company to gradually increase the output of copper. Mason & Smith having bought the "Pewabic" property at a total cost, including all expenses of litigation, estimated at about $800,000, made a transfer of the same to the Quincy Mining Company in consideration of the issue to them of the 10,000 shares of increased stock, which was brought into being by the action of the stockholders, when the capital stock was increased from 40,000 to 50,000 shares June 5, 1889. By increasing their capital 25 per cent. the Quincy Mining Company was enabled to acquire additional mining territory and thus increase the output of copper also. Since acquiring the "Pewabic" Mine, the company's product has more than doubled during the past six years. The production of the Quincy Mining Company in 1896 was 16,863,477 pounds of refined copper, against 16,304,721 pounds in 1895. For the first six months of 1897 production was 10,220,755 pounds of refined copper.

The capital stock of the Quincy Mining Company is now $2,500,000, divided into 100,000 shares of $25 each. The increase in capital stock from 50,000 to 100,000 shares went into effect on April 16, 1897.

From the year 1875 to January 1, 1896, including a period of 21 years, the number of diamond drill holes bored in the mine was 558, and the total depth drilled was 53,443 feet. Number 2 shaft is down a depth of 4,085 feet, Number 4 is 4,073 feet, and Number 6 is down 3,920 feet. The longest level in the mine is the forty-second, the entire length of which is 5,350 feet. The Quincy Mine and equipment is one of superior excellence, and prosperous as its past history has been, the future promises to be one of increasing success.

The officers of the company are as follows:

THOMAS F. MASON, *President.*
T. HENRY MASON, *Vice-President.*

Directors:

THOMAS F. MASON, GEORGE T. BLISS,
NATHAN H. DANIELS, T. HENRY MASON,
CLEVELAND H. DODGE, CHAS. J. DEVEREAUX,
SAMUEL B. HARRIS, of Michigan.

WILLIAM R. TODD, *Sec'y and Treas.*

PRODUCTION, ETC., OF THE QUINCY MINING COMPANY SINCE 1890.

We have made the following compilation and comparison, viz.:

Year.	Mineral, Lbs.	Refined Copper, Lbs.	Mining Profit.	Dividends.
1890	10,002,850	8,064,253	$581,080 17	$400,000
1891	12,827,075	10,542,519	393,203 54	450,000
1892	13,621,815	11,103,926	279,638 85	300,000
1893	17,708,035	14,398,477	493,399 12	350,000
1894	18,864,754	15,484,014	590,055 92	400,000
1895	19,732,970	16,304,721	692,074 21	600,000
1896	20,370,725	16,863,477	755,628 47	1,000,000
Total 7 yrs	113,128,224	92,761,387	$3,785,075 28	$3,500,000

OFFICIAL STATEMENT

OF ASSETS AND LIABILITIES, EXCLUSIVE OF REAL ESTATE, MINE PLANT AND SUPPLIES IN USE, JANUARY 1, 1897.

Assets.

Cash at New York Office, and Copper		$729,072 18
Cash at Mine		16,736 14
Accounts receivable		183,451 96
		$929,260 28

Liabilities.

Drafts unpaid	$ 740 98	
Dividends unpaid	1,070 00	
Accounts payable in New York	45,551 72	
Accounts payable at Mine	94,964 07	
		142,326 77
		$786,933 51
Add at Mine:		
Supplies per inventory on file	$133,914 81	
Teams, etc	6,716 00	
		140,630 81
		$927,564 32

WILLIAM R. TODD.

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SUMMARY FOR THE YEAR.

Average force employed	1,042 men
" number of miners	379 "
" wages of miners on contract, per month	$52.00
Yield of mineral per fathom of ground broken	576 lbs.
" refined copper per fathom of ground broken	477 "
Total rock mined	637,113 tons
" " hoisted	577,024 "
" stamp rock treated	555,543 "
Product, mineral from stamp mill	15,251,410 lbs.
" " " rock houses	5,119,315 "
" refined copper	16,863,477 "

GENERAL SUMMARY

Of Receipts and Expenditures of the Quincy Mining Company from its Organization to December 31, 1896.

Expenditures.

For expenditure on location previous to 1856	$ 42,097 98
" " on Quincy vein, 1858, not now worked	55,000 00
" Openings and explorations on 3,800 feet, east of Pewabic vein, extending to Portage Lake, preparatory to future work	11,500 00
" Real estate and permanent improvements on same, including dwelling houses, stamp mill, machinery, steam engines, railroad, dock, warehouse, and other buildings and roads	2,096,437 00
" Mining and surface labor, expenses of smelting and marketing copper, and all incidental expenses	19,114,503 86
Balance carried down	9,597,564 32
	$30,917,103 16

Receipts.

From Capital Stock paid in	$200,000 00
" Proceeds of copper and silver (199,388,521 lbs. copper)	30,331,072 84
" Interest	236,849 34
" Profit on sale P. L. & R. Improvement Company stock, and other investments,	79,637 16
" Sales, real estate, Hancock, Mich	69,543 82
	$30,917,103 16

Balance brought down, being receipts over expenditures	$9,597,564 32
Deduct dividends declared, Nos. 1 to 56x inclusive	8,670,000 00
Balance	$927,564 32

Tamarack Mining Company.

The Tamarack Mine is west of the Calumet & Hecla, and includes a vast territory. The company owns 1,160 acres of mineral land, under which the Calumet conglomerate and the Osceola amygdaloid lodes dip at an angle of 38°. In order to reach the lode it was necessary to do deep vertical sinking, but expert mining men believed that rich copper deposits would be found if the task was undertaken. The sinking of the first shaft on the property involved an outlay of nearly $200,000, and about two years and a half of work, before the copper shoot was struck at a vertical depth of 2,300 feet. This mining feat attracted wide attention, and great credit belongs to Captain John Daniel and his associates for the successful accomplishment of this initial achievement. No. 1 shaft has since been sunk to the depth of 3,232.9 feet, beyond which, we understand, no further sinking will be done there.

Mining was begun in 1885, and the amount of ground taken out since beginning of operations on the lode is estimated at not much over fifty acres. When it is stated that the distance between Nos. 2 and 3 shafts is nearly a mile, some idea of the great extent of mineral ground belonging to the Tamarack may be formed. The Tamarack is a great property, with great possibilities before it, and may be said to be only in its infancy. There are at present five shafts at this mine, all of which are vertical shafts. On August 7, 1895, ground was broken for shaft No. 5. This new shaft is 27 2-12 feet by 7 2-12 feet within timber, and is intended for four hoisting chambers, and a smaller chamber for piping and ladder way. This shaft is almost directly behind the Red Jacket shaft of the Calumet & Hecla, and great expectations are centered in it. It has reached a depth of over 1,400 feet, and is going down at the rate of about 100 feet per month. As this shaft is to go down to a depth of about 5,000 feet before reaching the lode, it will not be completed for some time to come. The new shaft is 3,300 feet north of No. 4, and should meet the same rich lode encountered in the Calumet & Hecla. If the vein at this point proves as rich as elsewhere, the value of the Tamarack Mine will be greatly enhanced, and its future production largely augmented. It is calculated that with a proper equipment 2,500 tons of rock per day can be handled through this shaft.

No. 2 shaft is at present the principal producer, and has been sunk 3,649 feet from the surface. This shaft is 600 feet north of No. 1, and was sunk 91.5 feet in 1896. A decided improvement is noted at many points in the lower levels at the south end of the mine, where this shaft is. When No. 5 shaft is completed it will be connected with No. 2 shaft at about 3,920 feet in depth.

No. 3 shaft is down 4,450 feet. This shaft is known as "North Tamarack," being located 4,200 feet north of No. 2 shaft. The lode at this shaft was encountered at a depth of 4,185 feet, and when found proved disappointing owing to its lean character. Drifting was done, however, north and south from the shaft, and a decided change for the better is reported, especially in the drifts going south. The rich run of productive ground in the Calumet & Hecla is going down by the dip of the lode between Nos. 2 and 3 shafts in the Tamarack, and as the distance between these shafts is nearly a mile, the magnitude of the Tamarack is apparent. The lode in No. 3 is very large, and said to average 21 feet in width. Openings have been made of 4,089.6 feet at this shaft on the lode. No. 3 shaft has recently been furnishing about 40 per cent. of the rock sent to mill. No. 4 shaft is the same depth as No. 3, at which point it struck the lode. Connections have been made between shafts Nos. 3 and 4. At No. 4 shaft the lode has not yet revealed much of value, but better results are anticipated as sinking progresses. The lode is very wide in No. 4 shaft, and averages fully 22 feet.

The Tamarack added a new stamp mill to its plant last year. It is built of steel, and has two 20-inch cylinder "heads" of the "Ball" type, with various improvements. The capacity of the new mill is placed at about 600 tons of rock per day. The company's old mill has five "heads," with an average stamping capacity to each "head" of 290 tons of rock per day.

During the year 1896 there was hoisted from the Tamarack Mine 575,960 tons of rock. Of this amount 42,219 tons were from crosscuts and winzes, and the balance, 533,741 tons, were broken from the lode. The amount stamped was 490,625 tons, at total cost of $2.28 per ton of rock stamped, and of the rock mined of $1.94. Amount of mineral obtained for the year 1896 was 23,628,899 lbs. There was a gradual improvement during the last half of the year owing to the richer quality of rock taken from No. 3 shaft. The output of refined copper for 1896 was 16,045,039 lbs., against 14,900,316 lbs. the year previous.

The Tamarack Mining Company has a capital stock of $1,500,000, divided into 60,000 shares of $25 each. The total dividends paid since April 2, 1888, to July 3, 1897, amount to $5,010,000. The officials of the Tamarack are the following:

President:

A. S. BIGELOW.

Directors:

A. S. BIGELOW,	LEONARD LEWISOHN,
THOMAS NELSON,	JOSEPH S. BIGELOW,
CHARLES VAN BRUNT,	EDWARD S. GREW,

WILLIAM E. PARNALL, of Michigan.

Secretary and Treasurer:

THOMAS NELSON (now deceased.)

November 24, 1897. The Tamarack Mining Company declared a dividend of $3 per share, payable December 31, 1897, making $6 per share in 1897. Total dividends by Tamarack Company now amount to $5,190,000.

ADOLPH LEWISOHN.

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The following is the last financial statement of the Tamarack Mining Company, viz.:

REPORT.

The Directors submit the following report of the operations for the year ending December 31, 1896:

Gross receipts from sales of copper and interest receipts......		$1,746,188 36
The costs have been—		
Running expenses at mine.......	$1,116,787 00	
Smelting, transportation, and all other expenses of handling copper...............	260,704 61	
Total running expenses............		1,377,491 61
Showing a mining profit of................................		$ 368,696 75
Balance of assets, December 31, 1895.......................		1,031,328 55
		$1,400,025 30
Dividends Nos. 26 and 27...................	$360,000 00	
Construction account and sinking No. 5 shaft.	256,720 68	
		616,720 68
Balance of assets, December 31, 1896.................		$783,304 67

Atlantic Mining Company.

The Atlantic Mining Company was organized in December, 1872.

This company's mines are on a bed of "amygdaloid," which dips to the northwest at an angle of 54 degrees. It operates four shafts on the dip of the bed, the deepest of which is 2,225 feet. The bed averages about 15 feet in thickness, and the workings extend for about 4,000 feet along its course. It is the uppermost of the series of beds which compose the so-called "Mineral Range" that has yet been proved to be copper bearing, and is remarkable for the uniformity, although comparative leanness, of the ore produced. The average yield of the ore in the stamp mill varies year by year between the extremes of about 0.625 and 0.725 per cent., or from 12½ to 14½ pounds of copper per ton, and the utmost economy and skillful management is manifested in the results obtained.

The company has, within the past three years, constructed a railroad from its mine to a point on the shore of Lake Superior, a distance of about nine miles, and erected there a new stamp mill, with its appurtenances, and dwellings for operatives. This mill is complete in its appointments, and contains six heads of steam stamps, 168 Collums jigs and 28 Evans slime tables, besides an electric lighting plant for lighting the interior of the mill by incandescent lamps, and the entire location by arc lights. The low grade of rock at this mine, and the successful way it has been managed, have made the Atlantic Mine famous.

The last annual report of the company gives the following statistics:

SUMMARY OF RESULTS IN 1896.

Ground broken in openings and stopes	20,629 fathoms
Rock stamped	371,128 tons
Product of mineral	6,449,600 lbs.
Product of refined copper	4,894,228 "
Yield of refined copper per cubic fathom of ground broken	237 "
Yield of rock treated, 13.19 per ton, or	0.66 per cent.

Gross value of product, per ton of rock treated	$1.43
Cost per ton of mining, selecting and breaking, and all surface expenses, including taxes	.7643
Cost per ton of transportation to mill	.0496
Cost per ton of stamping and separating	.2487
Cost per ton of working expenses at mine	1.0626
Cost per ton of freight, smelting and marketing product, including New York office expenses	.1747
Cost per ton of running expenses	1.2373
Total expenditure (including construction) per ton of rock treated	1.3599

SUMMARY OF RECEIPTS AND EXPENDITURES OF ATLANTIC MINING COMPANY

FROM DATE OF ORGANIZATION TO DECEMBER 31, 1896.

Receipts.

Capital stock paid by consolidation	$700,000 00	
" " assessments	280,000 00	
		$ 980,000 00
Sales of copper		10,053,518 88
Other sources		853 15
		$11,034,372 03

Expenditures.

Real estate ("South Pewabic" and "Adams" Mines, buildings, railroad, stamps, etc., as valued at consolidation)	$659,642 11	
Real estate (land since purchased)	51,106 66	
	$710,748 77	
Net expenditure for additional equipment, mining operations, smelting and marketing copper, taxes and incidentals	9,444,337 88	
		10,155,086 65
Balance of receipts, being net profits to date		$879,285 38
Deduct dividends paid		700,000 00
Net surplus, December 31, 1896		$179,285 38

The Atlantic Mining Company has a capital stock of $1,000,000, in 40,000 shares of $25 each.

The officers of the company are as follows:

President:

JOSEPH E. GAY.

Directors:

JOSEPH E. GAY,
J. R. STANTON,
J. W. HARDLEY,
JOHN STANTON,
ISAAC B. CRANE,
WM. C. STUART,
SAMUEL L. SMITH, of Michigan.

Secretary and Treasurer:

JOHN STANTON.

Osceola Consolidated Mining Company.

This company was organized in 1873, and during the period of its operations has produced 95,617,308 pounds of copper. Work was originally begun upon the Calumet conglomerate, and continued on that vein for some time, but the productive ground in that vein not proving as rich as the celebrated Calumet & Hecla property, attention was directed to the development of an amygdaloid belt which was discovered on the Osceola's property. This amygdaloid lode has been successfully operated, and has afforded a large yield of copper. The vein bears north 39 degrees east, and dips to the northwest 40 degrees, its width being from 3 feet to 30 feet. In 1880 a consolidation was effected with the Opechee Mine. This estate joined the Osceola on the south, and comprised 400 acres of land. The Osceola has an extensive territory of 760 acres of mineral lands.

The Osceola has six shafts, but the product has been derived principally from Nos. 3, 4 and 5. No. 4 shaft is down 65 feet below the 34th level, and No. 5 shaft has reached 50 feet below the 35th level. A disastrous fire occurred at No. 3 shaft September 7, 1895, by which thirty men lost their lives. This shaft has since been retimbered, and went into commission again over a year ago. The company started a new shaft March 5, 1895, on the south strike of the mine, and is known as No. 6. It is 17x7 feet within timber, and is planned for two hoisting chambers for a double skip, and a third roomy chamber for pump and ladder way. It is now down 2,220 feet, and is regarded as giving good promise of adding a substantial increase to the Osceola's output of copper. It is intended to make connections with No. 5 shaft from the lower levels of No. 6. By the end of 1897 it is expected No. 6 shaft will reach the 31st level, and the new shaft, when completed, will be able to take much of the rock formerly hoisted at No. 5. A new hoisting equipment has been contracted for, and new stone buildings required for the necessary machinery have been erected. A new rock house is also to be provided, so that No. 6 shaft may be expected to begin hoisting before very long.

During the year 1896 the quantity of rock hoisted was 278,517 tons, 30,455 tons of which were discarded, and 248,062 tons stamped. Cost of stamping was $24\frac{788}{1000}$ cents per ton. The yield of refined copper per cubic fathom of ground broken was 404 lbs. Percentage of refined copper in stamp rock was 1.26%. Product of mineral in 1896 was 7,365,739 lbs., yielding 6,251,304 lbs. of refined copper. The cost per ton of rock hoisted was $1.86, and the total cost per pound of refined copper for the past year was 9.64 cents, against 8.75 cents in 1895.

The Osceola Company has an efficient stamp mill of 6 "heads." A new boiler house and two new boilers were added to the equipment at the stamp mill during 1896. The new building is 142 by 69 feet in ground plan, and high enough to admit a train of cars to run through it and deposit coal in front of boilers.

The directors of the Osceola met September 20, 1897, and unanimously voted to recommend to the stockholders an increase of the capital stock to two million five hundred thousand dollars ($2,500,000), and of the number of shares to one hundred thousand (100,000). The plan contemplates the consolidation of the Osceola with the Kearsarge and Tamarack, Jr. The directors of the above-mentioned companies have all met, and recommended the consolidation of these producers. If the plan, as it now stands, is adopted, the 50,000 new shares of Osceola stock will be used to buy the Kearsarge and Tamarack, Jr., properties, paying 25,000 shares for the former and 16,000 shares for the latter, the remaining 9,000 shares to remain in the treasury for subsequent disposal by the directors, the treasury to receive the final proceeds. Amalgamation of this group of mines would also include the Iroquois property recently acquired by the Osceola.

The capital stock of the Osceola Company is $1,250,000, divided into 50,000 shares of $25 each. Since November 15, 1878, to July 26, 1897, the total dividends paid by the company amount to $2,172,500.

The officers of the Osceola Company are as follows:

President:

A. S. BIGELOW.

Directors:

A. S. BIGELOW,	GUSTAV STELLWAG,
THOMAS NELSON,	LEONARD LEWISOHN,
J. HENRY BROOKS,	CHARLES VAN BRUNT,

WILLIAM E. PARNALL, of Michigan.

Secretary and Treasurer:

THOMAS NELSON (now deceased)

REPORT OSCEOLA CONSOLIDATED MINING COMPANY.

The Directors submit the following report of the operations for the year 1896, and statement of the financial condition of the company:

From the sales of 6,251,304 lbs. of refined copper, silver sales, sale of building lots at Hancock, and interest receipts.....		$687,017 85
The total costs have been....................................		602,908 74
Total net income for year....................................		$ 84,109 11
Balance of assets, December 31, 1895..........................		273,062 65
		$357,171 76
Dividend No. 41, paid July 25, 1896.............	$50,000 00	
Dividend No. 42, paid February 1, 1897.........	50,000 00	
		100,000 00
Balance of assets, December 31, 1896..................		$257,171 76

Since writing the foregoing the proposition to consolidate the Kearsarge and Tamarack, Jr., with the Osceola has been approved and ratified.

November 24, 1897. The Osceola Mining Company declared a dividend of $1 per share, payable December 31, 1897.

VIEW OF HOUGHTON AND PORTAGE LAKE, MICHIGAN.

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Franklin Mining Company.

This company was organized April 23, 1857, and lies north of the Quincy Mine. The property consists of one-quarter section of land, located at Hancock, Michigan, with the lode on the lower half of it only, and notwithstanding that the Franklin has reached its limits, in so far as depth is concerned, the management expect, from all appearances, a fair yield of copper for several years to come. During the year 1896 the mine produced 3,367,218 pounds of mineral, which yielded 81.553 per cent., or 2,746,076 pounds of refined copper. The total amount of rock hoisted during the past year was 135,156 tons, and the amount stamped was 122,079 tons. Pounds of mineral in ton of rock stamped was 27.58, and the per cent. of mineral in ton of rock stamped was 1.379. Since the beginning of operations in 1857 the mine has produced 111,499,184 pounds of mineral, yielding 90,544,069 pounds of refined copper.

In 1894 the Franklin Mining Company purchased 1,359 acres of land northeast of the old mine, and this new property is now known as the Franklin, Junior. This recently acquired property was formerly known as the Albany & Boston, and later as the Peninsula Mine. Considerable work was done by these concerns in the effort to develop a paying mine, but the quantity of copper found by former operators did not encourage a continuance of operations. Since the property has been acquired by the Franklin, however, energetic work has been done under the present *régime* with encouraging results. What is known as the Pewabic shaft on the Franklin, Junior, property is particularly promising. This shaft is on a lode which crosses the entire new property, about seven thousand feet in length, or about four times the length of the lode in the old mine, which has been worked with such splendid results. Crosscuts have been made from this shaft with the view of exploring the ground both east and west of this lode, but until lately nothing of value was found. Parties well posted in the geology of the country are confident that the lode is none other than the Pewabic lode, so long worked by the Franklin, Pewabic, and Quincy Mining Companies with such great success.

The Pewabic shaft is down 750 feet, or 50 feet below the seventh level. Drifts from the second, fourth, fifth and sixth levels are all showing well in copper ground, and the management believe that when this lode alone is properly developed, they will have a large mine capable of yielding more copper than has been produced from the old mine, and of a higher percentage of mineral, for some 600 tons of entirely unselected ore gave the yield of 1.71% mineral, equal to 1.4 refined copper. A second shaft was started in May, '97, 1,050 feet south of No. 1, and is in the lode. Operations are being conducted on an active scale, and the company has undoubtedly demonstrated the fact that it possesses a valuable mine, warranting bright expectations for the future.

A shaft has also been sunk in the Osceola lode, which lode was reached at a depth of 158 feet, and found promising in character. A crosscut was made in search of the Calumet and other lodes. The length of this crosscut is now over 2,600 feet. Both the Calumet and Osceola lodes have been struck and drifted upon, but so far nothing of value has been found. The Kearsarge conglomerate is also found on the property. A vertical shaft has been sunk 75 feet, and from the bottom a crosscut was drifted 223 feet, when the Kearsarge lode was found. With so many copper-bearing lodes found on the Franklin, Junior, new successes are doubtless ahead for the Franklin Mining Company, and the development of a new big mine may be the result.

The officers of the company are as follows:

President:
THOS. H. PERKINS.

Treasurer:
D. L. DEMMON.

Manager:
GRAHAM POPE.

Directors:
THOS. H. PERKINS, O. D. ASHLEY,
R. E. DEMMON, D. L. DEMMON,
GRAHAM POPE, of Michigan.

Below is given a summary of the year's business ending December 31, 1896:

Receipts.

2,746,076 lbs. copper produced (on hand estimated at 11¾ cents)		$307,355 93
Interest		92 06
		$307,447 99

Expenditures.

Running expenses at mine as per yearly cost sheet	$246,893 29	
All other expenses, including smelting, freight, insurance, etc.	39,896 41	
		286,789 70
Showing the mining profit for the year 1896 to be		$20,658 29
Surplus, December 31, 1896, reported		$153,487 45

Above is the net surplus, after deducting $64,835.24, amount expended at Franklin, Junior, during the year 1896.

The Franklin has a capital stock of $1,000,000, divided into 40,000 shares of the par value of $25 each. Total dividends paid to date amount to $1,280,000. The Franklin, Junior, is owned and controlled by the Franklin Mining Company. Franklin shares advanced from $11 in January to $25½ on September 20, 1897.

Central Mining Company.

This company has worked for many years upon a fissure vein, which crosses, at nearly right angles, the beds which compose the Mineral Range, dipping towards the east at an average of about 85 degrees. It is opened by two shafts and 32 levels, No. 2 shaft being vertical and 2,670 feet deep.

Like other veins of this character in the Lake Superior formation, this vein is very irregular in size as well as in its copper contents. It is often but a mere seam and entirely barren, but at times widening out and becoming productive in masses and rich stamp rock.

It has produced the largest mass of "native" copper ever found (about 600 tons), and about two-thirds of its entire production, which up to the close of 1896 amounted to 50,813,825 pounds of refined copper, has been in the form of masses of large or small dimensions. The small masses are easily blasted out and sent to the surface, where they go under a steam hammer to be cleaned from adhering rock. The masses that are too large to be thus disposed of are cut into smaller pieces by sharp chisels that are so handled by expert workmen as to cut channels through a mass at convenient points by taking successive chips, in such a manner as to leave the channels perfectly true. These blocks of copper go directly to the smelting works to be refined.

This mine has been remarkably successful, the entire paid-up capital having been only $100,000, while the dividends declared amount to $1,970,000. The mine is, however, at present quite poor. At the 30th level a "fault" in the formation was encountered which shifted the vein about 300 feet, with the effect of terminating the "ore body" which had been so productive from the surface down to that point. Extensive explorations on the vein below the fault fail to reveal the presence of any material quantity of copper, and operations are now confined to extending some of the upper levels along the course of the vein above the fault, with the hope of finding another "ore body" that will be profitable.

The following are the officers of the Central Mining Company:

President:

JOSEPH E. GAY.

Directors:

JOSEPH E. GAY, WM. C. STURGES,
ROBERT PORTERFIELD, JOHN STANTON,
J. R. STANTON, EDWARD A. DAY,
JAMES DUNSTAN, of Michigan.

Secretary and Treasurer:

JOHN STANTON.

REPORT OF THE CENTRAL MINING COMPANY.

The Directors present the following report of the operations during the year 1896:

The production of mineral was 348$\frac{170}{2000}$ tons, which yielded about 67$\frac{4}{10}$ per cent., or 469,243 pounds of refined copper.

The following is a summary of the year's business:

Production.

469,243 lbs. copper at about 11$\frac{08}{100}$ cents		$51,996 03
Add interest received		1,227 19
		$53,223 22

Costs.

Working expenses at mine	$55,628 98	
Smelting, freight and all other expenses	12,475 35	
Making the total expenses		68,104 33
And showing a deficiency in 1896 of		$14,881 11
The surplus in 1895 was		65,140 13
Making the net surplus, December 31, 1896		$50,259 02

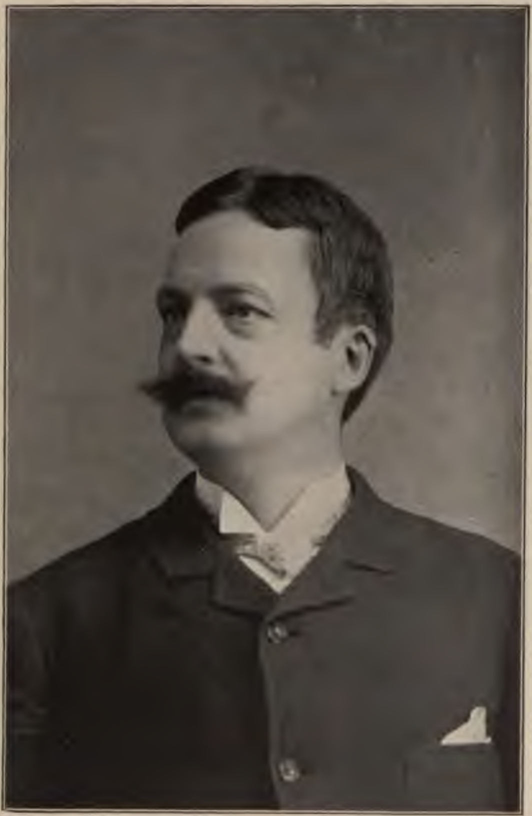
Wolverine Copper Mining Company.

This company operates on an amygdaloid bed known as the "Kearsarge Amygdaloid," its workings being separated from those of the "Kearsarge Mine" only by an arbitrary sectional line.

The bed upon which these companies operate has not hitherto been worked at any other point, and its copper-bearing qualities have not been recognized until quite recently. Geologically, it is under the principal cupriferous beds of the region, which here dip to northeast from 40 to 42 degrees from the horizontal; measurements across the beds showing the horizontal distance at right angles with the formation to be about 2,750 feet from the "Calumet conglomerate."

The Wolverine Mine was started in January, 1882, and worked by residents of the region until November, 1884, when, owing to lack of capital with which to conduct operations, work was stopped, and was not resumed until August, 1890, when the property was purchased by Mr. John Stanton and associates, who have opened up the mine extensively, and equipped it in a business-like manner, and for three years past have realized a handsome profit on the operations.

Equipment is now being placed on the property designed to double its output, and there seems to be no doubt that this mine will henceforth be a regular and profitable producer of copper.



J. R. STANTON.

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COPPER SMELTING WORKS, HANCOCK, MICH.

The Tamarack, Junior.

The property of this company consists of mineral land purchased from the Tamarack Mining Company, and comprises three forties in Section 11. Two vertical shafts have been sunk to the lode, which was reached at a depth of about 2,450 feet. Present depth of No. 1 shaft is 2,893 feet, or over, and that of No. 2 shaft a little over 3,040 feet deep, with a distance of about 800 feet intervening between them. The company has 40,000 shares, and assessments amounting to $640,000 have been called in. In 1892 the product in refined copper amounted to 796,769 pounds, and this was more than doubled the year following. Last year the output was 1,897,845 pounds of copper, against returns of 2,605,000 pounds in 1895. Total production to December 31, 1896, aggregates 9,259,202 pounds of refined copper.

The Tamarack, Jr., is working on the Calumet conglomerate, and rock obtained is reported to be very rich in copper. Operations lately have been carried on at No. 1 shaft, where recent sinking has been done. No. 2 shaft is used for hoisting the bulk of rock coming to surface. The per cent. of copper per ton of rock stamped is almost as much as in the Kearsarge, and runs as high as 1.91. Operations at Tamarack, Jr., in the recent past have raised expectations regarding this mine, and future developments are awaited with interest. The proposed consolidation of this interest with the Osceola and Kearsarge properties may still further conduce to develop its resources. The Tamarack officers have also the supervision of this property. No report having ever been issued, we are unable to append a financial statement.

Kearsarge Mining Company.

This mine is another Lake Superior property, and is located north of the Wolverine. It has two shafts, but No. 1 is only down to the sixth level. A large amount of opening work was done the past year, and much of this new ground is said to be of more than average grade. No. 2 shaft is that by means of which operations are carried on, and it is now down to the twentieth level. The production of refined copper for 1896 was 1,377,226 pounds, and returns show an aggregate output for the past ten years of 14,512,073 pounds. The Kearsarge has paid a total of dividends amounting to $160,000, the last of $1.00 per share being on August 10, 1897.

The output for 1896 was 568,936 pounds less than the previous year, which was owing to a lack of sufficient stamping facilities. The company, however, has now a new mill in operation, thereby increasing the capacity of the plant for the future. During the twelve months of last year 34,587 tons of rock from the Kearsarge were treated by the Tamarack or Osceola stamps, 22,863 tons being stamped in the first five months of the year, which yielded in those five months 830,700 pounds of fine copper. With its own new stamp mill, a much better product will doubtless be the result henceforth. Sinking and drifting was actively carried on last year, and shaft No. 2 was sunk 210 feet, while the total levels drifted were 5,065.7 feet. Superintendent Parnall reported early in the year his belief that there was more copper ground in sight than was ever seen at any one time in the history of the mine. The lode of the Kearsarge resembles that of the Wolverine in its very bunchy character.

The yield of refined copper per cubic fathom of ground broken was 449 pounds, and the percentage of refined copper in stamp rock was as high as 1.99. Cost of rock hoisted was $1.97 per ton, and total cost per pound of refined copper for the year 1896 was 9.76 cents. The high cost of copper is explained by the restricted output. The company is under the same competent management as the Tamarack and Osceola properties, and with the excellent outlook at the mine, combined with the existing equipment, the Kearsarge Mine should make material advancement.

The officers of the Kearsarge are the following:

President:

CHARLES VAN BRUNT.

Directors:

A. S. BIGELOW,
LEONARD LEWISOHN,
THOMAS NELSON,
CHARLES VAN BRUNT,
WILLIAM E. PARNALL, of Michigan.

Secretary and Treasurer:

A. S. BIGELOW.

REPORT OF THE KEARSARGE MINING CO.

The following is a report of the operations for the year 1896, and statement of the financial condition of the company :

From the sales of 1,377,226 pounds of refined copper, silver sales, and interest receipts	$162,297 38
The total costs have been	134,368 02
Total net income for year	$ 27,929 36
Balance of assets, December 31, 1895	163,567 73
Balance of assets, December 31, 1896	$191,497 09

COPPER SMELTING WORKS, HANCOCK, MICH.

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Centennial Copper Mining Company.

This property adjoins the Calumet & Hecla on the north, and comprises the whole of Section 12. It was formerly worked by the Schoolcraft Mining Company from 1863 to 1873, but could not be made to pay, and in 1876 the property was sold. The purchasers organized the Centennial Mining Company, and a great deal of money was expended in the attempt to find copper in paying quantities, but without success, and the mine was again shut down. A reorganization of the company was effected in 1888, and a good deal of work done in sinking shafts and drifting, but eventually failing to obtain satisfactory returns, the mine became involved in litigation and active operations were again suspended.

Another reorganization, however, was brought about, as all faith in the property had not died out, and the present company took the mine in hand last July. Previous thereto the mine was unwatered, and work undertaken since has given rise to strong anticipations that the Centennial is destined to become a paying mine. It is hoped that a more thorough investigation of the Calumet & Hecla conglomerate lode on the Centennial will yet lead to the discovery of rich copper ground on that vein. The Osceola and Kearsarge lodes, which also underlie the property, are expected to show up in copper, and altogether the outlook for this property has greatly changed for the better within a twelvemonth. The company has a stamp mill capable of treating 225 tons per day, and other buildings and machinery on the property. The present management have been so successful already that there is talk of starting the stamp mill soon. The following is the treasurer's statement, dated Boston, July 1, 1897, viz.:

Assets.

Cash in bank	**$140,339 32**
Cash and surplus at mine June 1st	**3 740 85**
	$144,080 17

Liabilities.

Mortgage note and interest (since paid)	**$72,068 00**
Balances of assets	**72,012 17**
	$144,080 17

Officers of the company are as follows:

President:

H. F. FAY.

Treasurer:

FRED'K BECK.

Directors:

H. F. FAY,	WM. BASSET,
THOS. H. PERKINS,	JOHN C. WATSON.

ROBERT M. THOMPSON.

Sketch of the Orford Copper Company.

In the spring of 1878 the Orford Nickel and Copper Company was formed, and procured a charter from the Quebec Legislature. Work was commenced shortly after on the Orford Nickel Mine, and continued until about the close of the year. A furnace was erected to be heated by gas, produced by wood, for treatment of the ores, but on account of a rapid fall in the price of nickel, caused by the opening of the new Caledonian Mine, the nickel work was abandoned. Early in the spring of 1879 the company acquired by purchase what was then known as the Crown Mine, now known as the Eustis Mine. They also leased the mines and works of the Canadian Copper and Sulphur Company, all located at Capelton, Quebec. The ores in the various mines in this district are pyritic, containing about 40% sulphur, 4% copper, and about $3.00 value, gold and silver. The Canadian Company's works were remodeled, and where the wet process had been in use the Orford Company erected a smelting plant. The ore was then roasted in open heaps to get rid of the sulphur. Operations were carried on to the extent of (3,000) three thousand tons or more monthly, getting a product of matte containing about 40% copper, which was shipped to England or Baltimore.

Early in 1880 the Canadian Company canceled their lease. This led to the erection of a smelting plant at what is now known as Eustis Village. This plant was run very successfully for about two years. In the fall of 1881, inquiries were made by one of the largest acid makers near to New York City, as to the purchase of ore for its sulphur value. The negotiations ended in a contract for (1,000) one thousand tons monthly. Other acid concerns followed in the same line, and the results were the shutting down of the Canadian smelting plant at Eustis, and the building of what is now known as the Orford Copper Company's works at Constable Hook, N. J. In the year 1882 the name of the company was changed to the Orford Copper and Sulphur Company, that being in line with the business then carried on.

In the year 1887 the company was reorganized into two divisions, one taking the mining interests under the name of the Eustis Mining Company, and the other engaging in manufacturing lines, known as The Orford Copper Company.

At the time the United States decided to use nickel in the manufacture of armor plate for the armored vessels of the navy, The Orford Copper Company put itself in a position to meet the needs of the Government, and established the nickel industry in this country on such a basis that the Government was enabled to get its nickel at the lowest price ever known in the world, and of a very superior quality.

The capacity of the present plant of The Orford Copper Company for refining from ores and mattes received from various parts of the United States, Canada and Mexico, is about 3,000,000 pounds of copper, and about 400,000 pounds of nickel monthly. The nickel is produced in the form of oxide and of metallic nickel, such as shot, plaquettes, ingots or bars. Other products are also handled, such as electrolytic copper and nickel.

Price of Lake Ingot Copper at New York.

IN CENTS PER POUND.

	1896.		1895.		1894.		1893.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
January.....	9.75	10.25	9.85	10.00	10.00	10.25	12.25	12.50
February....	10.25	11.25	9.65	10.00	9.62½	10.00	12.00	12.25
March.......	10 75	11.25	9.35	9.75	9.37½	9.62½	11.75	12.00
April........	10.75	11.00	9.37½	9.87½	9.37½	9.50	11.00	11.50
May...	10.75	11.62½	9.75	10.75	9.25	9.37½	11.00	11.12½
June........	11.50	12.00	10.50	10.75	9.00	9.12½	10.50	11.00
July........	11.00	11.50	10.62½	12.00	9.00	9.12½	10.00	10.50
August......	10.50	11.15	11.75	12.25	9.00	9.12½	9.62½	10.12½
September..	10.75	11.00	12.00	12.25	9.12½	9.87½	9.75	9.87½
October.....	10.50	11.00	11.87½	12.25	9.50	9.75	9.75	9.75
November...	10.75	11.50	11.00	11.75	9.37½	9.50	9.75	10.25
December...	11.25	11.60	10.00	11.00	9.50	10.00	10.37½	10.50

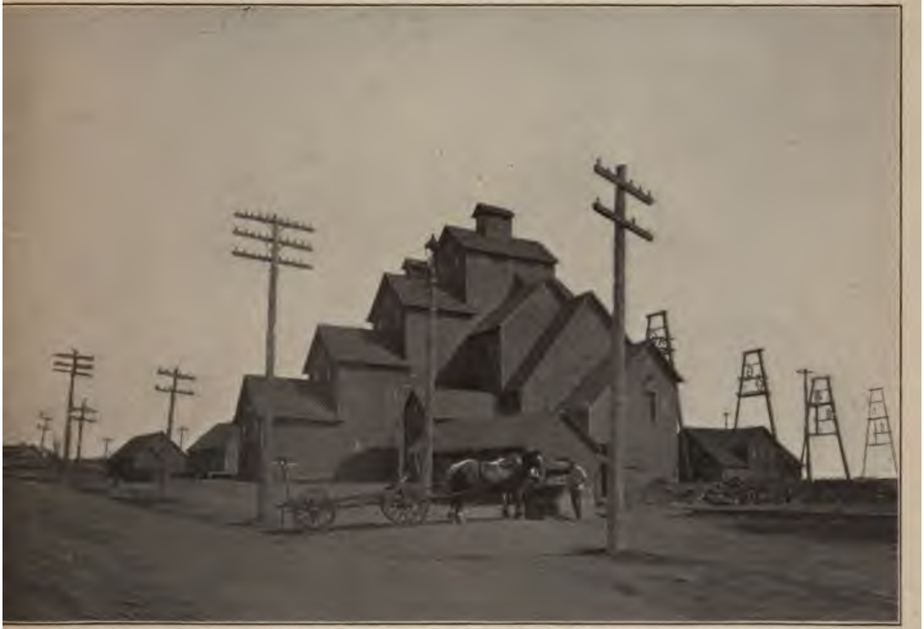
Lake Superior Copper Mines Now in Operation.

MINE.	Nature of Deposit	Dip of Deposit.	Average Width of Deposit.	Number Shafts in Operation.	Depth in Feet Deepest Shaft.	Tons Rock Hoisted, 1896.	°Tons Refined Copper, 1896.	Approx. Tons Copper to Date.	Per Cent. Copper Per Ton Rock Stamped.	Dividends to October 1, 1897.
Calumet & Hecla	C.	37½"	15 Feet.	11	‡4,900 ‡5,870	....	*46,287	....	....	$50,850,000
Quincy	A.	51"	12 "	8	‡4,085	577,024	8,481	104,804	1.87	9,470,000
Tamarack	C.	37½"	18 "	8	‡4,520	575,960	8,018	68,021	1.66	5,010,000
Osceola	A.	41"	15 "	4	‡3,600	278,517	3,126	47,808	1.26	2,172,500
Atlantic	A.	54"	15 "	4	‡2,225	374,980	2,447	86,616	.66	700,000
Franklin	A.	52"	12 "	2	‡3,200	185,156	1,378	45,272	.99	1,280,000
Wolverine	A.	42"	14 "	3	‡1,850	108,320	1,118	4,100	1.18	None.
Tamarack, Jr.	C.	37½"	12 "	2	†3,000	64,574	949	....	1.91	None.
Kearsarge	A.	42"	16 "	1	‡2,000	55,151	683	....	1.99	160,000
Central	F.	85°	4 "	1	†2,670	Mostly Mass.	848	28,108	2.54	1,970,000

C. Represents Conglomerate.
A. " Amygdaloid.
F. " Fissure Vein.

† Vertical Depth.
‡ Depth on Lode.

° Tons of 2,000 Pounds.
* Fiscal year ending April 30, 1897.



SHAFT ROCK HOUSE OF THE QUINCY MINING CO.

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Production of Lake Superior Copper Mines.

The following table gives the production of mineral and refined copper by the Lake Superior copper mines, during the calendar year 1896:

Mining Company.	Mineral, Lbs.	Refined Copper, Lbs.
Tamarack	23,798,152	16,045,039
Quincy	20,370,725	16,863,477
Osceola	7,365,739	6,251,304
Atlantic	6,449,600	4,894,228
Franklin	3,367,218	2,746,076
Wolverine	2,557,445	2,237,698
Tamarack, Jr.	2,561,844	1,897,845
Kearsarge	1,570,305	1,377,226
Central	696,170	469,243
National	62,440	47,363
Mass	56,354	38,684
Ridge	19,042	14,823
Adventure	10,612	7,720
Evergreen Bluff	5,713	4,078
Hilton	3,669	3,107
Knowlton	2,277	1,745
Total	68,897,305	52,899,656
Calumet & Hecla	....	90,456,933
		143,356,589 lbs.

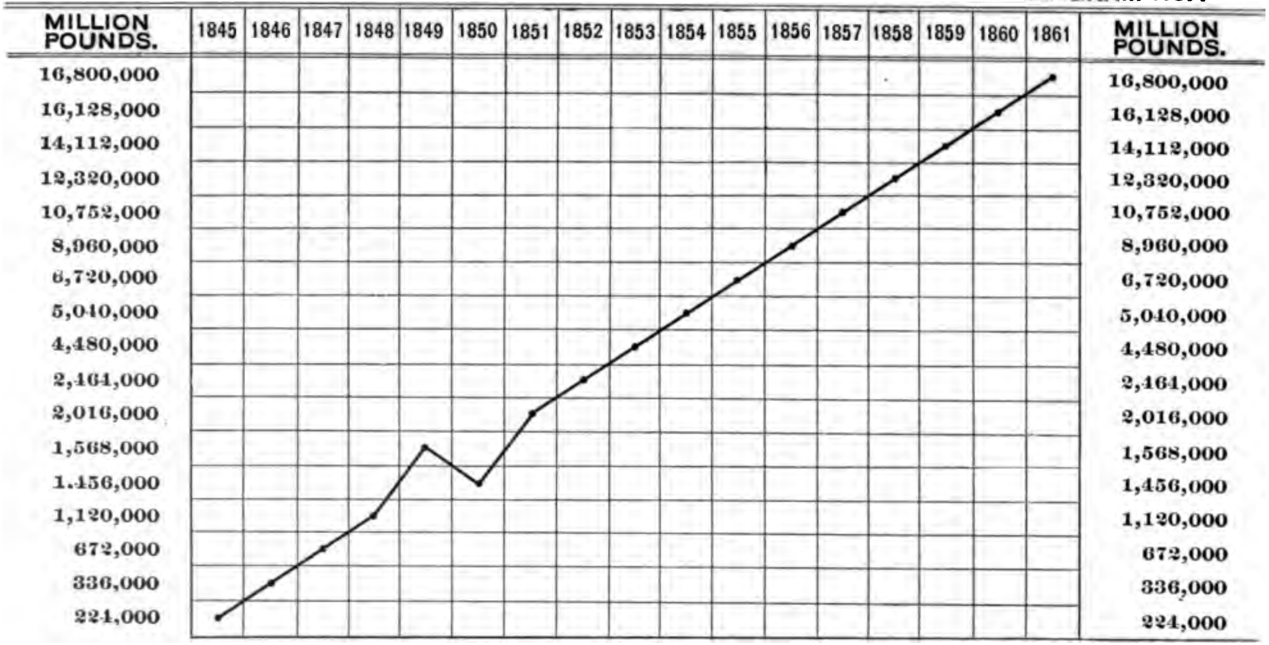
Copper Mining Shares.

The following table shows the comparison in prices of the leading copper mining shares, and of the market value of the several properties based on the share valuation, on the dates given :

Mine.	Lowest, 1893.		September 20, 1897.	
	Price, Shares.	Market Value.	Price, Shares.	Market Value.
Calumet & Hecla	$247	$24,700,000	$495	$49,500,000
Tamarack	112	5,600,000	143	8,580,000
Quincy	80	4,000,000	121	12,100,000
Boston & Montana	15	2,250,000	152	22,800,000
Osceola	20	1,000,000	41	2,050,000
Butte & Boston	5	1,000,000	31	6,200,000
Atlantic	7	280,000	27¾	1,110,000
Franklin	8½	340,000	25½	1,020,000
Tamarack, Jr	11	440,000	20	800,000
Kearsarge	4¾	237,500	23½	1,175,000
Wolverine	¾	45,000	18¾	1,125,000
Centennial	1¾	140,000	24	1,920,000
Total 12 mines		$40,032,500		$108,380,000

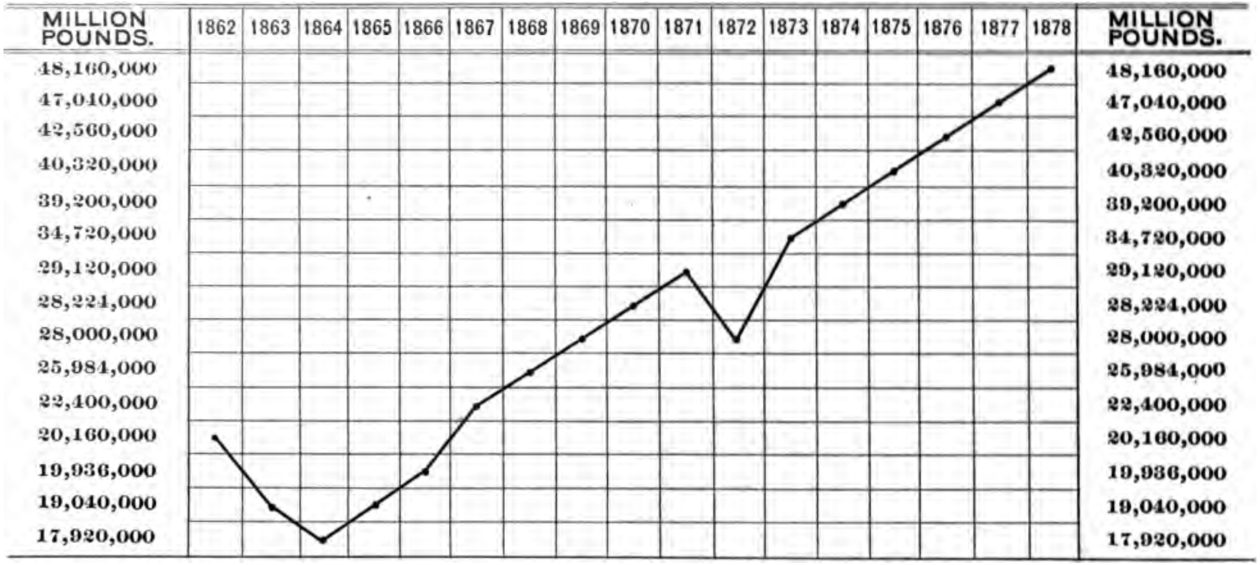
COPPER PRODUCTION OF THE UNITED STATES.

DIAGRAM No. 1



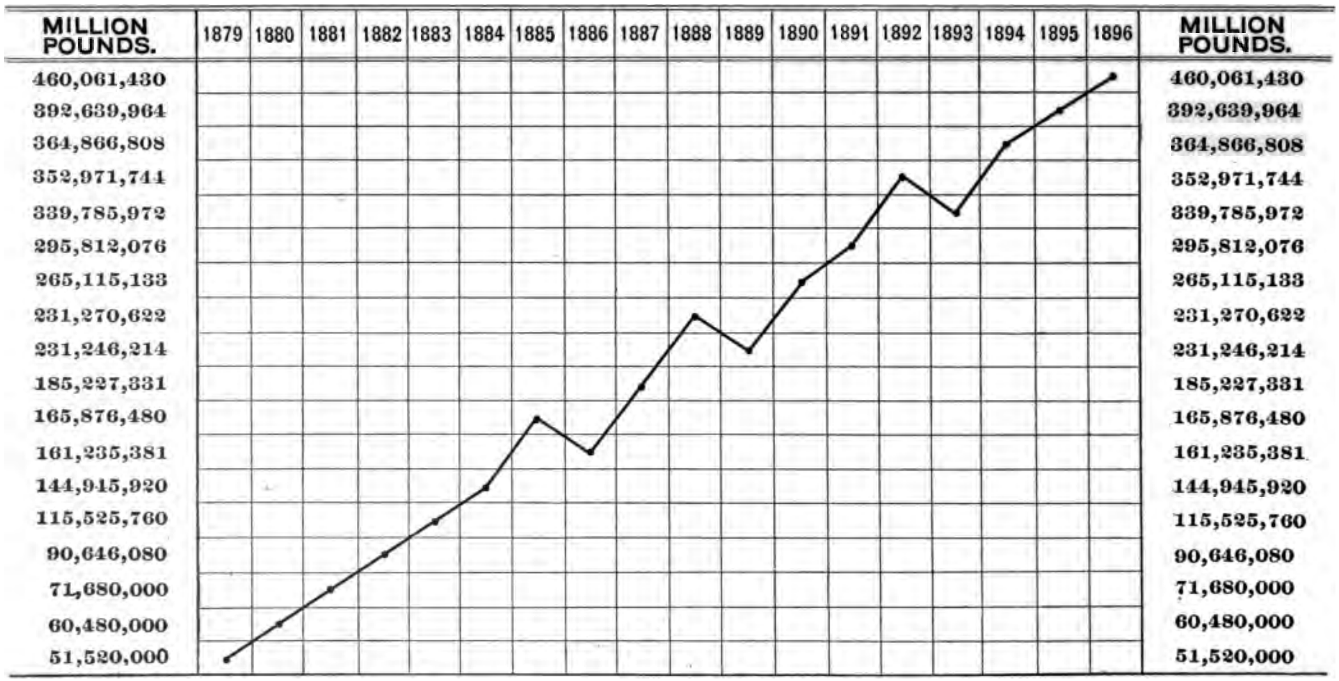
COPPER PRODUCTION OF THE UNITED STATES.

DIAGRAM No. 2



COPPER PRODUCTION OF THE UNITED STATES.

DIAGRAM No. 3



United States Exports of Copper by Countries.

United States exports of copper by countries, as per Government figures, for the year 1896, compared with 1895, were as follows :

Exported Ingots, Bars, Etc.	Year 1896. Pounds Fine.	Year 1895. Pounds Fine.
To United Kingdom	65,888,751	24,064,694
" Germany	27,535,951	14,962,257
" France	53,703,798	25,266,032
" Other Europe	111,518,392	56,236,915
" British N. America	419,495	398,906
" Mexico	135,667	151,664
" West Indies and Bermuda.	.....	1,721
" Other countries	21,870	246,201
Total ingots, bars, etc.	259,223,924	121,328,390

Copper in Matte.

" United Kingdom :

Tons.		Tons.	
17,750 at 55% fine =	21,868,000 lbs.	13,710 at 55% fine =	16,890,720 lbs.

" Germany :

1 at 55% fine =	1,232 lbs.	114 at 55% fine =	140,448 lbs.

" Other countries :

750 at 55% fine =	924,000 lbs.	....
Grand total 12 months..	282,017,156 lbs. fine.	138,359,558 lbs. fine.

The total value of the above exports of copper for the year 1896 amounted to $30,216,914, against $13,854,020 for the year 1895.

Production of Gold, Silver and Copper in Montana.

The following are the figures of the production of gold, silver and copper in the State of Montana, during the past three calendar years, which we have received from the U. S. Treasury Department.

Year 1894.

			Value.	
Gold	187,135.253	fine ozs.	$3,868,428 87	
Silver	13,638,967.29	"	17,634,219 78	(coining value.)
Copper	186,310,472	pounds.	17,233,718 66	

Year 1895.

			Value.	
Gold	198,405	fine ozs.	$4,101,400 00	
Silver	17,569,100	"	22,715,600 00	(coining value.)
Copper	201,092,992	pounds.	21,114,869 00	

Year 1896.

			Value.	
Gold	209,207	fine ozs.	$4,324,700 00	
Silver	16,737,500	"	21,640,404 00	(coining value.
Copper	232,096,483	pounds.	25,356,541 00	

Production of Copper, Including Precious Metals, in Arizona.

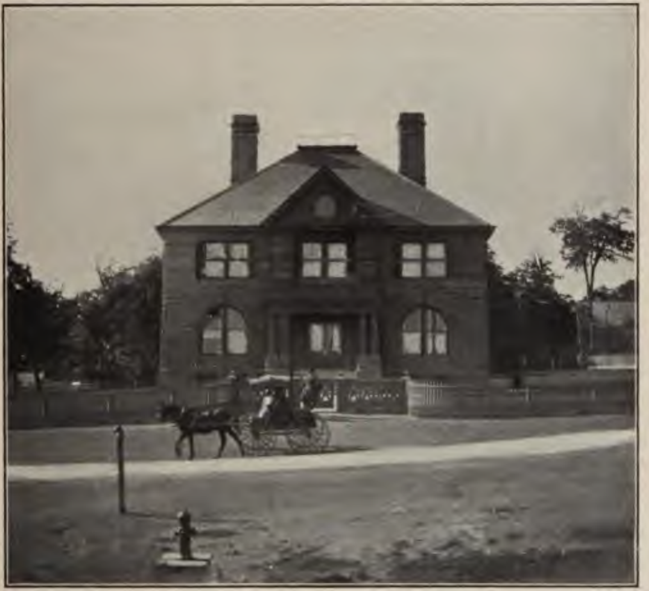
The following is the production of gold, silver and copper in Arizona, for 1895 and 1896:

Year 1895.

		Value.
Gold........	95,072 fine ozs.	$1,965,800
Silver...........	986,900 "	1,275,990 (coining value.)
Copper..........	47,958,553 pounds.	$4,795,355 30 (est.)

Year 1896.

		Value.
Gold............	125,978 fine ozs.	$2,604,200
Silver...........	1,913,000 "	2,473,373 (coining value.)
Copper..........	72,934,927 pounds.	$7,293,492 70 (est.)



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Production of Copper, Including Precious Metals, in Michigan.

The following is the production of gold, silver and copper in Michigan, for 1895 and 1896:

Year 1895.

		Value.
Gold................	2,075 fine ozs.	$42,900
Silver................	37,800 "	48,220 (coining value.)
Copper..............129,330,749 pounds.		$13,903,055 51 (est.)

Year 1896.

		Value.
Gold................	1,800 fine ozs.	$37,200
Silver............ ...	59,000 "	76,283 (coining value.)
Copper..............148,524,069 pounds.		$15,758,942 78 (est.)

Production of Copper, Including Precious Metals, for the Whole United States.

Year 1895.

		Value.
Gold............	2,254,760 fine ozs.	$46,610,000
Silver...........	55,727,000 "	72,051,000 (coining value.)
Copper..........	392,639,964 pounds.	38,682,347

Year 1896.

		Value.
Gold............	2,568,182 fine ozs.	$53,088,000
Silver....	58,834,800 "	76,069,236 (coining value.)
Copper..........	460,061,430 pounds.	49,456,603 (est.)

Arizona Copper Mines.

Arizona is now the third largest copper-producing district in the United States. The output is derived principally from half a dozen mines, located at Clifton, Bisbee, Globe and Verde. The total Arizona product of copper for the year 1896, as per the returns of the Copper Producers, amounted to 72,934,927 pounds. Explorations for copper were carried on thirty years ago, or over, in Arizona, but the difficulties arising from trouble with the Indians, and inaccessibility of location, proved considerable barriers in the first attempts to develop the copper resources of that Territory. In 1874 a little copper was produced, and in 1880 developments began to assume an interesting and important character, when Arizona was credited with a copper output of 2,000,000 pounds for that year. Since then production has increased rapidly, and the copper industry in that Territory is firmly established on a substantial basis, yielding annually a handsome remuneration on the capital invested.

The Copper Queen Consolidated Mining Company has been in operation since 1880, and has met with great success in developing a rich and valuable mine. It leads the list of copper producers in Arizona, turning out annually a larger quantity of copper than any of the other mines in the Territory. It is operated and controlled by the eminent and well-known firm of Phelps, Dodge & Co., who are also owners of other important copper mines in Arizona, and under excellent and skillful management these properties have been brought up to a high state of efficient development. The Copper Queen is located at Bisbee, on the Southern Pacific Railroad, where the company has built up a plant fitted out with costly machinery and well equipped with the necessary facilities for insuring and maintaining a large production. The Copper Queen made the largest production in its history last year, the product in fine copper for the year 1896, as furnished us by the company, being 23,298,150 pounds, or 7,556,419 pounds more than for the year 1895. This mine in the past has produced an abundant quantity of high-grade ore, and no doubt it has ample reserves of ore yet to be blocked out, which will long enable it to occupy the prominent position it now holds among the Arizona producers. Officers of the Copper Queen are J. Douglas, President; G. Notman, Secretary and Treasurer.

The United Verde Mining Company ranks second in production among the Arizona copper mines, and is held to be a mine of remarkable richness. Its product for the year 1896 is given as 22,328,413 pounds, or 5,837,011 pounds more than in 1895. It is understood this mine yields handsome returns to its owner, and there is the impression that the property is one of unusual value through the abundance of the mineral deposits which await development.

The Old Dominion Mine at Globe is a property of demonstrated value, and has been a producer of copper for years. The present owners purchased the property a little more than two years ago for $1,000,000, and the new corporate organization of the Old Dominion Copper Company was completed September 18, 1895. Working capital was furnished by the sale of 20,000 shares of the stock at the par value of $25 per share, thereby raising $500,000 in cash for the treasury of the new organization. The company has a capital stock of $3,750,000, divided into 150,000 shares of the par value of $25 each. Although the Old Dominion has produced considerable copper during the past two years, the mine has only been partially worked until the new railroad connection is in operation. We are informed that the road is expected to be built in about six months from November 1, 1897.

After the new company acquired possession of the property the work of exploration was soon begun, which resulted in such quick discoveries of ore in ground, as confirmed the diagnosis of the property made by experts before the sale was consummated. We have seen a carefully prepared report giving some idea of the work done, and some excerpts will show what may be expected from the Old Dominion when active mining gets under way at this property. Exploration work at the various levels exposed veins of ore assaying from 10 per cent. to 43 per cent. At the first level a vein 3 feet 3 inches in width was found of 20 per cent. ore, and expected to continue to surface. This ore also went down on footwall. At the second level drifting south was done, which showed small but widened from the first, until they had 10 feet of blue ore in face of drift. At this level old workings were cleaned out, and a small streak of ore 6 inches wide opened at a distance of 12 feet to a vein of rich ore 6 feet in width, when stoping was done. Drifting west on footwall was done, when ore was struck after advancing 10 feet, and solid ore top and bottom and side for 40 feet was cut through. Some of this ore assayed 43 per cent. copper; after running a further distance of 15 feet vein narrowed down to 2 feet. This was considered a splendid showing, and was thought should extend down through virgin ground to fifth level, as everything pointed to a big body on footwall.

At the fifth level a winze was sunk for 43 feet in almost solid oxide ore. This was expected to be one of the largest stopes, yielding both oxides and sulphides which occur side by side. At the seventh level a winze was sunk 53 feet in sulphide vein. Crosscutting was also done at this level, and rich ore was struck before going 5 feet. The main shaft has been sunk below the eighth level, and another compartment added to it. In going through the old abandoned workings it was found that in nearly every case they will yield ore of a paying grade and in quantity. The large body of 10 per cent. sulphide ore struck in sinking the winze below the seventh level was regarded as an excellent discovery. Such a report speaks for itself, and indicates the possibilities in store for this property. The Old Dominion Mine is under the experienced and thoroughly conversant Bigelow-Lewisohn management, and a good report from it is expected when the 70 miles of new railroad are completed. The directorate of the Old Dominion consists of A. S. Bigelow, Thos. Nelson, Leonard Lewisohn, Henry M. Whitney, Moses T. Stevens, Jos. G. Ray and Edgar Buffam.

PRODUCTION OF COPPER BY ARIZONA MINES.

(COMPUTED.)

	1896.	
Copper Queen Con. Mining Co	23,298,150	lbs.
United Verde Mining Co	22,328,413	"
Arizona Copper Co	12,472,000	"
Detroit Copper Mining Co	7,016,348	"
Old Dominion Copper Co	5,620,000	"
United Globe Mines	2,020,565	"
Other Mines, about	390,268	"
Total	73,145,744	lbs.

Butte & Boston Consolidated Mining Company.

This company has worked several mines, besides owning numerous mining claims in Montana. The principal operations have been carried on at what is known as the Silver Bow No. 1 and No. 2, the East Grey Rock, and the Blue Jay. A great deal of work has also been done on different mines and mining claims which they were developing under lease and bond. The Silver Bow workings, during the period of active operations, were carried on energetically, resulting in quite a large output. At Silver Bow No. 1 the main shaft has been sunk 1,000 feet, and is built with three compartments, timbered with square sets 10x10 and 8x8. The main shaft at Silver Bow No. 2 is two-compartment to the 500-foot level, and three-compartment below to the 700-foot level, also timbered with square sets and 10x10 timbers. These mines were provided with three exits and excellent ventilation.

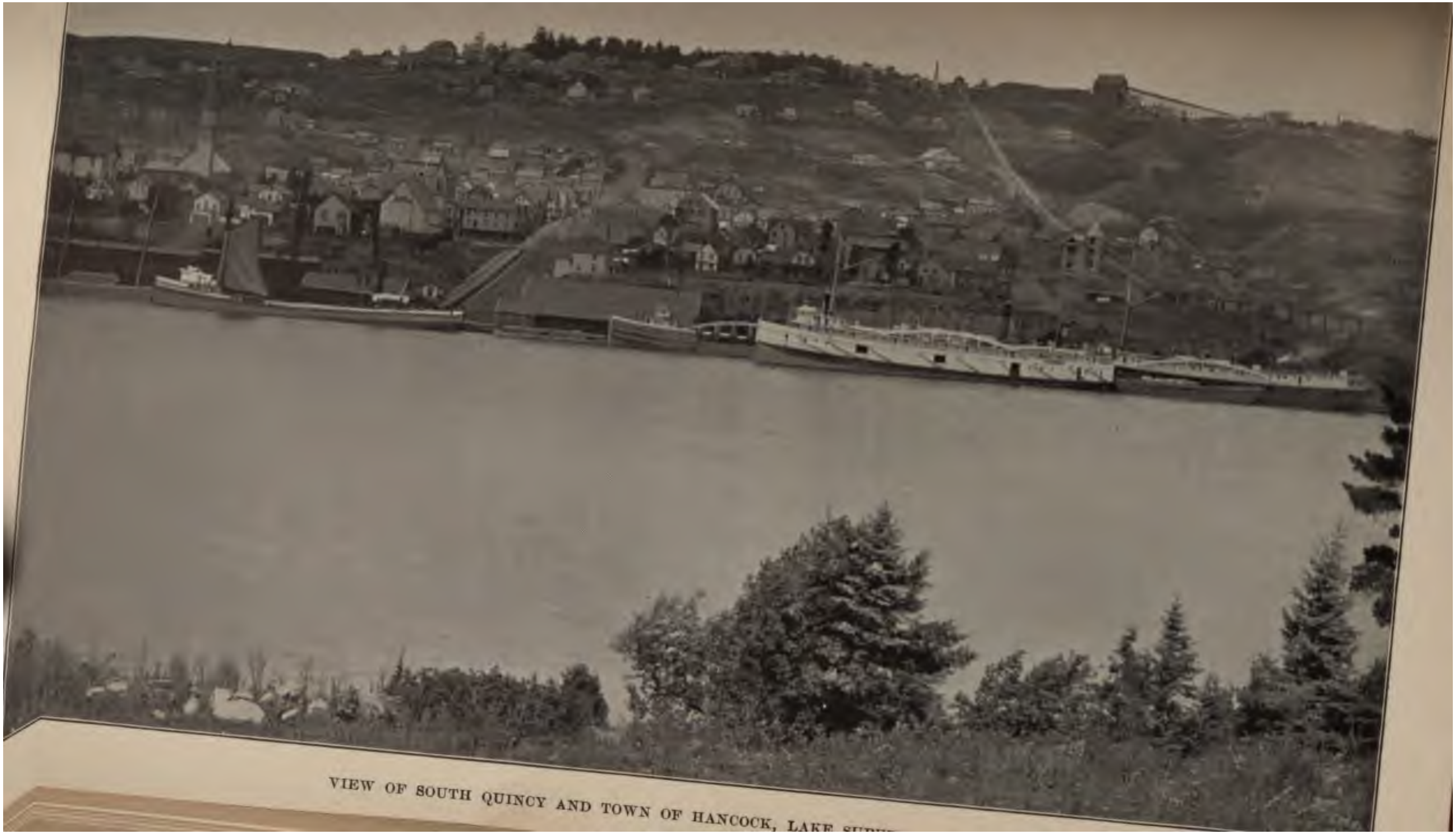
At the East Grey Rock Mine the main shaft is 1,400 feet deep. A large shaft house was erected in 1892, and new hoisting machinery installed with all modern improvements for hoisting. There are two ledges, but the principal work was done on the south ledge. The Blue Jay has a two-compartment shaft sunk to a depth of 650 feet. A new shaft at the Blue Jay, of superior workmanship, was undertaken, which would furnish an extra exit and increased ventilation. Before the shutdown in 1895, the company's output was reported at about 1,800,000 pounds of copper per month, and during 1893 returns gave a product of 2,340,000 pounds of refined copper and 85,690 ounces of silver in a single month of that year. The company has been reorganized with a capital stock of $2,000,000, in 200,000 shares of $10 each. Possessing so many mining claims, the Butte & Boston presumably has much latent mineral wealth awaiting development. The mineral belts at Butte are wonderfully rich on the adjacent properties, and it would be strange if paying ore bodies did not exist on these claims, also. It will be interesting, however, to know whether future discoveries on the Butte & Boston properties will show a preponderance of silver or copper as new ground is explored. If the veins show plenty of copper a splendid mining property should be developed.

Other Montana Mines.

The Parrot Mine is located in Butte, and is operated by the Parrot Copper Company. It is a producer of copper and silver, and work has been carried on at this property for about the past seventeen years. The main shaft is 911 feet deep, with three compartments to the 400-foot level, and four-compartment thereafter to the bottom of shaft. The best system of ventilation prevails at this mine, and the supply of air at the lowest levels equals in purity that obtained on the surface. West of this mine the company is operating another property known as Parrot No. 6. The Virginius is also operated by the Parrot Company, but the shafts at the latter two are not so deep as at the original Parrot. The Moscow Mine of Butte belongs to the Parrot Company, and, like the rest, furnishes an ore containing copper and silver.

The Colorado Smelting and Mining Company owns the Gagnon Mine of Butte. The main shaft has been sunk to a depth of 1,324 feet, and is on an incline pitching at an angle of seventy-three degrees. This mine has been in operation for the past twenty years.

The Montana Ore Purchasing Company operates the Rarus Mine, where the main shaft is 760 feet deep. Production of this company for the year 1896 was 14,895,000 pounds of fine copper, 450,000 ounces of fine silver, and about 30,000 ounces of gold. The Washoe Mine is a prospective producer, where sinking has been going on for the past two or three years. If reports are correct the Washoe may be expected to attract attention as developments progress.



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Electrolytic Refining of Copper.

The electrolytic refining of copper is of comparatively recent origin. The first patents for refining copper by this process were taken out in the years 1865–1869 in England, and within the period covered by these dates the first electrolytic copper refinery was built at Pembrey, near Swansea. Germany started a small refinery in 1872, and the method was also introduced into France, but previous to 1880 the development of the industry was on rather a limited scale, and the combined output of all the European electrolytic plants in those early days would appear of modest proportions alongside of the enormous output of electrolytic copper in this day. Since this process has come into vogue the electrolytic refining of copper has developed into an industry of great magnitude.

The number of electrolytic refineries in the world is estimated at about 30. There are from 11 to 14 in this country, ranging in capacity somewhere from 30 to 3,000 tons per month of refined copper. Among the processes employed in the United States we mention four: the Multiple, the Smith, the Hayden, and the Stalmann. The Smith process was patented November 27, 1888; the Hayden December 22, 1891; and the Stalmann January 19, 1892.

In the Multiple process the arrangement of vats contains an equal number of anodes and cathodes. The electrolyte is a solution of sulphate of copper, and the anodes are 97 to 98 per cent. black copper. The electrodes are suspended in a vertical position in wooden lead-lined vats in the Multiple process. Density of current, good circulation of the electrolyte, and a uniform specific resistance in the solution of sulphate are the requisites to insure the regular deposition of the plates under treatment.

The "Smith process" differs in arrangement from the Multiple, in that the anodes are placed horizontally in the bath, the layers resting on strips of wood running lengthwise of the vat. No cathodes of pure copper are employed. The solution of sulphate of copper circulates between the anodes, and decomposition takes place from the under side of the plate and is deposited on the upper surface of the plate beneath. Screens of cloth are stretched between layers to catch the gold and silver and other insoluble matters as they are liberated by the action of the solution and electric current.

In the "Hayden process" the plates are placed in a vertical position, and are held in place by vertical wooden strips, to keep said plates from contact with each other. This arrangement supports the plates above the bottom of the bath, which are unconnected electrolytically excepting through the solution in the bath.

The "Stalmann process" has an initial anode and a terminal cathode, but the plates are inserted in pairs connected by bolts or rivets, each pair consisting of an anode of crude material and an independent cathode of refined material. The electrolyzing current passes through from the initial anode to the terminal cathode, through the paired plates in the vat, which are in metallic conductive connection. In the Smith and Hayden processes cathodes of refined copper are done away with, but it has been claimed that the Multiple process, in which anodes and cathodes are employed, gives a purer copper. Other processes have been tried in Europe, by which the experiment has been made of producing electrolytic copper direct from "matte" carrying 35 to 55 per cent. copper, but this method and that of extracting copper direct from the ores by electrolysis do not appear to have attracted much attention by reason of their success.

The electrolytic refineries in this country have been planned on a large scale, and their combined capacity is estimated at over 200,000,000 pounds per annum, against 17,000,000 pounds for the year 1888. The remarkable development in this branch of the copper industry has occurred within a dozen years, and its importance is apparent. The recovery of the gold and silver contained in the raw copper by the electrolytic process, at a minimum cost, and the ability to produce a pure copper, are the strong recommendations in favor of this method. The Anaconda and Boston & Montana Companies are the largest producers of electrolytic copper, and their plants in Montana, by recent extensions, are notable examples of complete and finely equipped refineries.

The Rio Tinto Company, Limited.

Although the deposits of copper found on the Rio Tinto property have been known to exist from a very remote period, it is only since 1876 that this mine, under energetic English management, began its modern career as the principal European copper producer.

Authentic history records the fact that these Spanish mines were not only operated by the Romans 2,000 years ago, but even at an earlier age by the Phœnicians before their subjugation by the Romans. Vast accumulations of slags and cinders disposed of around the limits of the property, and workings of an extensive character which were discovered at the mine, furnish ample evidence that these Spanish deposits must have yielded large quantities of copper many centuries ago. The numerous statues which adorned the ancient Pantheon, and formed that galaxy of mythical deities, may possibly owe their metallic origin to those Spanish copper mines.

Notwithstanding the fact that this property has furnished such an abundant supply of metal in the dim past as well as during modern times, the store of cupriferous deposit at these mines continues enormous. The company pursues a system of exploration which enables the manager of their mines to give an estimate of the Reserves. The quantity opened up has been estimated to be not less than 135 millions of tons, which, at the rate of output of 1,400,000 tons per annum, represents enough for 97 years' work. Of this quantity it is estimated that 35 millions of tons consist of ore poor in copper, leaving 100 millions of tons of a quality not under the average of what has been worked in the past—or, say, 70 years' supply. This does not include copper in the masses yet to be explored. The copper production during 1896 was 34,501 tons fine, against 32,985 tons fine in 1895, and 32,689 tons in 1894. In April, 1897, the Reserve Heaps were stated to contain 109,651 tons of fine copper, which stood in the company's books at £4. 6s. 10d. per ton, these figures being far below their value.

The capital stock of the company is divided into 325,000 shares of £10 each fully paid up. The Rio Tinto had a very successful year in 1896, the profitable operations last year enabling the company to declare and pay dividends amounting to 38s. per share, or 19 per cent., being the largest amount disbursed during any year in its history. The last annual report showed a cash balance of £506,988, besides a reserve fund in Consols of £100,000. The 325,000 shares of the company have lately been divided into Preferred and Ordinary ; the par value now of the shares being £5 each, with a fixed dividend upon the Preferred Share of five per cent. This change was consummated in May, 1897. In 1895 the whole of the outstanding First, Second and Third Five Per Cent. Mortgage Bonds were redeemed by an Issue of £3,600,000 First Mortgage Bonds bearing interest at four per cent. The Directors had the co-operation of N. M. Rothschild & Sons in making this change. The saving by the operation in 1895 was £64,000, and in 1896 £74,000 or over. Offices of the company are 30 St. Swithin's Lane, London. The following constitute the Board of Directors :

Chairman:

HUGH M. MATHESON.

Deputy-Chairman:

J. J. J. KESWICK.

WM. DUFF BRUCE, M. I. C. E.,
MAJOR-GEN. ARTHUR E. A. ELLIS, C. S. I.,
R. W. B. JARDINE,
JOHN MACFARLAN,
LIONEL C. G. SARTORIS.

PRODUCTION OF RIO TINTO COMPANY, LIMITED.

PYRITES AND COPPER STATISTICS.

	PYRITES EXTRACTED.				PYRITES CONSUMED.		Copper Produced at Mines.
	For Shipment.	For Local Treatment.	Total.	Average Copper Contents.	Tons.	Average Copper Contents.	Tons.
1876	189,962	159,196	349,158	1.5 p.c.	158,597	1.5	946
1877	251,360	520,391	771,751	2.375 “	211,487	2.	2,495
1878	218,818	652,289	871,107	2.78 “	211,403	2.18	4,184
1879	243,241	663,359	906,600	2.78 “	236,849	2.45	7,179
1880	277,590	637,567	915,157	2.865 “	274,210	2.481	8,559
1881	249,098	743,949	993,047	2.75 “	256,827	2.347	9,466
1882	259,924	688,307	948,231	2.805 “	272,826	2.401	9,740
1883	313,291	786,682	1,099,973	2.956 “	288,104	2.387	12,295
1884	312,028	1,057,890	1,369,918	3.234 “	314,751	2.241	12,668
1885	406,772	944,694	1,351,466	8.102 “	354,501	2.270	14,593
1886	336,548	1,041,833	1,378,381	3.046 “	347,024	2.306	15,863
1887	362,796	819,642	1,182,438	3.047 “	885,842	2.283	17,813
1888	434,316	969,317	1,403,633	2.949 “	393,149	2.208	18,522
1889	389,943	824,380	1,214,323	2.854 “	395,081	2.595	18,708
1890	396,349	865,405	1,261,754	2.883 “	397,875	2.595	19,183
1891	464,027	972,060	1,436,087	2.649 “	432,532	2.651 1.309	21.227
1892	406,912	995,151	1,402,063	2.819 “	435,758	2.569 1.465	20,017
1893	477,656	854,346	1,332,002	2.996 “	469,539	2.659 1.544	20,887
1894	498,540	888,555	1,387,095	3.027 “	485,441	2.594 .988	20,606
1895	525,195	847,181	1,372,376	2.821 “	518,560	2.595 .986	20,762
1896	591,752	845,580	1,437,332	2.931 “	549,586	2.529 1.068	20,817

RIO TINTO PRODUCTION AND SALES FOR 1896.

PRODUCE AT MINES.

Pyrites.—

The quantity extracted during the year was:

For shipment	591,752 tons.
" local treatment	845,580 "
Total	1,437,332 tons

with an average copper contents of 2.931 per cent., which is somewhat above the average of the previous year.

The quantity invoiced to consumers in England, Germany, and the United States, was 549,585 tons, against 518,560 tons in 1895, 485,441 tons in 1894, and 469,339 tons in 1893.

Copper Production.—

The copper produced during the year by treatment at the mines was	20,817 tons.
And the copper in pyrites shipped amounted to	13,684 "
Total	34,501 tons.

Copper Sales.—

The following quantities were brought to market, viz.:

Refined copper	17,777 tons.
Copper in sulphate of copper	980 "
Copper in pyrites	11,928 "
Total	30,685 tons.

The following is the Balance Sheet for the year 1896.

Dr. RIO TINTO

BALANCE SHEET

Capital and Liabilities.

To Share Capital—						
325,000 Shares of £10 each fully paid up				£3,250,000	0	0
" Four per cent. First Mortgage Bonds (1895)				3,546,020	0	0
" Creditors—						
Bills Payable	£120,800	0	0			
On Open Account (including Coupons payable 1st January, 1896)	126,651	1	3			
				247,451	1	3
" Reserve Fund				100,000	0	0
" Revenue Account, Balance at Credit thereof	639,032	0	2			
Deduct Interim Dividend, paid 1st November, 1896	292,500	0	0			
				346,532	0	2
				£7,490,003	1	5

COMPANY, LIMITED. *Cr.*

AT 31st December, 1896.

Property and Assets.

	£	s.	d.	£	s.	d.
By Mines	£3,331,095	10	0			
" Railway, Pier, Tunnel, and Railway Workshops and Rolling Stock, as per Inventories	1,106,155	14	3			
" Buildings, Workshops, Reservoirs, Fixed Plant, and Tramways at Mines, as per Inventories	747,086	12	2			
" Machinery and Movable Plant, as per Inventories	476,358	2	7			
" Land and Houses in Spain, as per Inventories	245,113	10	9			
	5,905,809	9	9			
Deduct General Depreciation Account	443,227	16	8			
				£5,462,581	13	1
" Extension and Development Works	121,075	2	7			
" Removal of Overburden, North Lode	73,254	11	8			
				194,329	14	3
" Ore, etc., extracted and in course of local treatment and in stock, also Manufactured Copper in stock in Spain, cost as per Inventories	609,460	13	4			
" Produce shipped and afloat and remaining on hand in Great Britain and elsewhere, as per Inventories	127,464	8	11			
				736,925	2	3
" Stores in Spain and elsewhere as per Inventories and in transit, at cost price	145,247	15	8			
" Sundry Trade Debtors and Bills Receivable	174,626	19	11			
				319,874	15	7
" Depôts at Garston, Rotterdam and Hamburg, and Works at Grange and at Cwm Avon	39,392	5	3			
" Furniture and Fittings in London Office and Laboratory	1,840	11	0			
				41,232	16	3
" Casa Colon, Huelva				14,317	3	10
" Investment in Consols, in Trust for payment of outstanding Five per cent. Mortgage Bonds				761	10	0
" Discount and Expenses of Issue of Four per cent. Mortgage Bonds	147,440	1	4			
" Stamp Duties on Registration of Mortgage in Spain, etc.	19,181	0	6			
	166,621	1	10			
Less Amount written off	53,980	0	0			
				112,641	1	10
" Preliminary Expenses, Division of Share Capital				350	13	2
" Reserve Fund in Consols				100,000	0	0
" Balances:						
Investments	165,030	14	11			
Cash at Bankers and on Deposit in London	321,883	19	4			
Cash in Spain and elsewhere	20,073	16	11			
				506,988	11	2
				£7,490,003	1	5

The Tharsis Sulphur and Copper Company, Limited.

The Tharsis Sulphur and Copper Company, Limited, was formed in 1866. It has in Great Britain five metal extracting works, situated at Glasgow, Hebburn and Willington (both near Newcastle-on-Tyne), Oldbury and Cardiff. It also owns a very large extent of land in the mining district of the Province of Huelva, Spain. The mines chiefly worked by the company are the Tharsis, Calañas, and Lagunazo, and they are all connected by means of the company's railway system with their private shipping pier at Huelva, near the mouth of the River Odiel. Tharsis is about 30 miles from Huelva, and the branch line to Calañas is about 20 miles in length. The mineral is cupreous pyrites, and is found in large lenticular-shaped deposits, which are nearly all worked by open cast. These mines have been known, it is believed, from 1,000 years B. C. Both Phœnician and Carthaginian remains have been found, and very complete and extensive Roman workings still exist. The mineral contains about 50 per cent. sulphur, 45 per cent. iron, 3 per cent. copper, with small quantities of gold, silver, lead, zinc, bismuth, nickel antimony, arsenic and silicon. When won, part of the ore is treated for copper at the mines by lixiviation, the copper contained in the liquors being precipitated on iron, in the form of cement copper, which is exported for further treatment in the company's metal works in Great Britain. The portion of the mineral mined but not treated in this fashion is exported to Britain and is there first roasted for its sulphur contents in the manufacture of sulphuric acid. The resulting cinder or burnt ore is afterwards further treated in the company's works for the contained metals, chiefly copper, gold, silver, lead and iron. The burnt ore is first mixed and ground with salt. It is then calcined and afterwards lixiviated in vats. The metals contained in the liquors being precipitated separately are then smelted and refined into merchantable form. The residue left in the tanks is purple ore, which is largely used in the manufacture of iron.

The Tharsis Sulphur and Copper Company, Limited, has a capital of £1,250,000, divided into 625,000 shares of £2 each, full paid. It has been remarkably successful from the first, and the actual net profits of the company have increased from £40,112 for the 17 months ending April 30, 1868, to £218,769 for the 12 months ending December 31, 1896. Their highest net earnings were during the calendar year of 1872, when they amounted to £355,429, but in that year Chili bar copper ranged from £83 to £107 per ton. During the past 30 years the available profits for division amounted to the total of £6,196,623, from which sum £5,695,932 have been paid in dividends, which is equal to 543⅛ per cent. on the dividend capital. The original value of mines, railways, shipping piers, rolling stock, works, buildings, machinery, and plant, including patents, leases, concession rights, etc., is estimated at £2,528,059 14s. 2d. There has been written off, up to December 31, 1896, on property and plant, etc., £1,981,528 2s. 7d. For salaries, management, interest, bad debts, etc., there has been appropriated during 30 years a total of £865,219.

Mining operations for the year 1896 resulted in extracting 253,204 tons of mineral from the Tharsis mines, against 278,441 tons in 1895—a decrease of 25,237 tons. From the Calañas mines 209,950 tons of mineral were taken in 1896, against 298,424 tons in 1895—a decrease of 88,474 tons; and from the Lagunazo mines the mineral extracted in 1896 weighed 94,423 tons, against 35,618 tons obtained in the previous year—an increase of 58,805 tons. The total quantity of mineral raised at all the mines during 1896 was 557,577 tons (exclusive of the cupreous sterile), against 612,483 tons in 1895—a decrease of 54,906 tons. Dividends paid in 1896 amounted to £218,750, equal to 17½ per cent. A similar dividend was paid in 1895. The following is the latest financial statement by the company:

Dr. THE THARSIS SULPHUR AND

ABSTRACT BALANCE SHEET,

Capital and Liabilities.

To Shareholders—			
625,000 Shares of £2 each, full paid	£1,250,000	0	0
" Reserve Insurance Fund	8,000	0	0
" Huelva Copper Company—			
Capital Shares unredeemed	3,976	0	0
" Creditors—			
Bills and Open Accounts	124,926	1	1
" Profit and Loss, being Balance at 31st December, 1896	234,458	2	9
	£1,621,360	3	10

GLASGOW, *24th March, 1897.*—We have audited the Books and Accounts of Dec., 1896, and we certify that the foregoing Abstract Balance Sheet for the said year

COPPER COMPANY, LIMITED. *Cr.*

AS AT 31ST DECEMBER, 1896.

Property and Assets.

	Original Value.	Written off till date.	
By Mines in Spain—			
Tharsis and Calañas....	£709,228 11 9	£574,228 11 9	£135,000 0 0
Lagunazo..............	48,690 0 5	6,190 0 5	42,500 0 0
" Railways and Shipping Piers in Spain—			
Permanent Way........	415,551 1 0	283,960 11 10	131,590 9 2
Rolling Stock..........	58,355 3 11	46,649 8 6	11,705 15 5
Shipping Piers.........	54,381 16 8	41,865 13 3	12,516 3 5
" Works, Buildings, Machinery, and Plant—			
In Spain..............	448,848 3 8	358,352 18 9	90,495 4 11
In Britain..............	394,877 13 8	272,153 15 0	122,723 18 8
" Miscellaneous Assets—			
Patents, Leases, Concession Rights, etc......	398,127 3 1	398,127 3 1	
	£2,528,059 14 2	£1,981,528 2 7	
" Stocks in Trade—			
In Spain (Including Preparatory Works).................			367,496 0 10
In Britain..			173,783 2 2
" Debtors on Open Accounts			109,436 18 0
" Bills, Securities, Cash at Bankers, and on hand..............			424,162 11 3
			£1,621,360 3 10

THE THARSIS SULPHUR AND COPPER CO., LIMITED, for the year ending 31st is correct, and that it exhibits a proper state of the Company's affairs at that date.

(Signed) ALEX. MOORE, C.A., *Auditor*.
R. C. MACKENZIE, C.A., *Auditor*.

The following are the officials of the Tharsis Company, viz.:

Chairman:

SIR CHARLES TENNANT, BART.

General Manager:

WILLIAM A. VEREL.

Secretary:

DAVID BARLAS.

Board of Directors:

Hugh Beckett,
James C. Stevenson,
James Couper,
Sir Charles Tennant, Bart.,
Holbrook Gaskell,
Sir James King, Bart.,
M. Jacques H. C. Deberly,
M. Eugene Joseph Desmarest,
M. Alfred D. Marie Messeau,
Hugh Brown,
M. Louis Oscar Schmidt.

The Cape Copper Company, Limited.

This company has a capital stock of £690,000, represented by 300,000 shares of £2 each fully paid, and 75,000 preference shares of £2 each (45,000 issued). The mines which this corporation operate are situated in Africa, and also at Tilt Cove, Newfoundland. The return of ore from the Ookiep Mine for the twelve months ending April 30, 1896, was 26,497 net dry tons. Underground reserves at this same mine were estimated at 33,900 tons of 21 per cent., compared with 41,500 tons of 21 per cent. at the close of previous fiscal year. The other African mines included in the group belonging to this company are the Spectakel, Nababeep and Copperberg. During the year, 18,207 tons of various kinds of ore were treated at the smelting works, and 5,614 tons of ore were extracted from the calcining stalls, from which a high-grade regulus was made.

At the Tilt Cove establishment the output for the year ending August 31, 1896, was within a few tons of the quantity produced the year previous, and the total shipments for the twelve months amounted to 53,826 tons ore and regulus. The quantity of ore and regulus smelted during the fiscal year was about 41,439 tons, which produced 19,446 tons, 19 cwt. of regulus. Most of this copper product was shipped to Swansea, and 10,823 tons to New York. Dividends paid in January and July, 1896, amounted to £77,625. Offices of the company, 9 Queen Street Place, London, E. C. The Directors of the Cape Copper Company, Limited, are as follows, viz.:

EDWARD A. PONTIFEX, *Chairman.*

JOHN GALSWORTHY,
HANBURY BARCLAY,
T. RUSSEL KENT,
JOHN TAYLOR.

Mason & Barry, Limited.

(San Domingo's Mine, Portugal.)

This company carry on copper-mining operations in Portugal, and have a registered capital of £630,000, in 210,000 shares of £3 each. The total quantity of ore raised at the mine during the year 1896 was 192,428 tons, as against 185,463 tons in 1895, and the shipments during the same period (inclusive of ore from the Cementation Works) amounted to 202,696 tons, against 186,368 tons in the previous year. The quantity of ore sold and invoiced for its sulphur value during 1896 amounted to 205,206 tons, as compared with 189,448 tons in 1895. The total profit for the year 1896 was £37,141 12s. 7d. The quantity of ore at the mine is stated at about 3,000,000 tons, equal to 12 or 15 years' supply.

The stocks of ore and copper precipitate broken, raised and on hand December 31, 1896 (exclusive of the stocks at the Wallsend Works), were valued at £227,457.

The mine assets in Portugal (after writing off for depreciation) stood, December 31, 1896, at £395,182. These assets embrace the following items, and compare with the preceding two years as under :

	1896.	1895.	1894.
Works, buildings, land, plant, etc......	£72,752	£84,843	£94,942
Railways, shipping piers, tug boats, etc.	66,861	72,082	74,691
	£139,613	£156,925	£169,633
Mine stores and cash assets....	48,161	53,128	50,148
Stocks of ore and copper precipitate....	207,408	246,854	295,494
	£395,182	£456,907	£515,275

The Mason & Barry's capital was reduced last year from £840,000 to £630,000. A dividend of three shillings and sixpence per share, or £32,405 2s., was declared out of the earnings for 1896. Offices of the company, 87 Cannon Street, London, E. C. The following are the officials of the Mason & Barry, Limited, viz.:

Directors:

HON. FRANCIS TRESS BARRY, *M. P.*, *Chairman*,

JAMES FRANCIS MASON, *Deputy Chairman*,

JAMES MASON, HENRY EDWARD BEDDINGTON,

CAPT. THOMAS BRIDGES HEATHORN, R. A.,

FRANCIS RICARDO, DOUGLAS HERRON BARRY.

London Metal Exchange.

OFFICIAL LIST

OF THE

Various descriptions and brands deliverable in fulfilment of contracts for copper of good merchantable brands.

I.—ROUGH COPPER (*i.e.*, Unrefined Copper) in slabs, bars or cakes, not under 93% Cornish assay, and certified on the assay note to be good merchantable quality.

American.—A. C. C.—B. & M.—C. Q.—D.—O. D.

Chilian.—A. Edwards—B. Larrain—C. C. C. C.—Chuchiñi (C. Lopez)—C. Jullian, Cabildo—C. M. M. (Compa. M. de Maipu)—C. V. Angeles (R. Humeres)—E. C. T. (E. Concha y Toro)—E. E. C. (J. & J. Edwards)—Felix Vicuña—F. P. P. (Perez)—G. (Geisse)—Huidobro Hnos.—I. V. (Villaroel)—J. J. E. (Echeverria)—Lambert 2—Lambert V.—Las Palmas, M. de F. (F. Zanetta)—Lota—Maitenes, C. C. y C. (Cousiño)—U. (Undurraga)—Urmeneta—V. A., Catemu (Vidal Aragon)—V. H. (Varas Hnos.)—Vicuña (S. Vicuña & Co.)—Yllapel, Y. Silva.

English.—C. L. & C.—Ditton—H. H. S.—Morfa—V. S.

Japanese.—(Cornish assay and quality to be guaranteed as above.)

Turkish.—Tokat.

London Metal Exchange Brands of Copper—Continued.

II.—RAW COPPER (*i. e.*, Refined Copper).

(*a*) In cakes, ingots or tiles.

English.—Tough and best selected, being the manufacture of the following firms, and bearing their recognized brands:

Bede Metal & Chemical Co., Ltd.
John Bibby, Sons & Co.
Thomas Bolton & Sons.
Broughton Copper Co., Ltd.
Cape Copper Co., Ltd.
Elliott's Metal Co , Ltd.
Henry Hills & Son.
Charles Lambert & Co.
Landore Copper Co.
Logan & Co.
Nevill, Druce & Co.
Newton, Keates & Bolton.
Rio Tinto Co., Ltd.
W. Roberts.
St. Helen's Copper Co., Ltd.
Tharsis Sulphur and Copper Co., Ltd.
United Alkali Co., Ltd.
Vivian & Sons.
H. H. Vivian & Co., Ltd.
Williams, Foster & Co., and Pascoe, Grenfell and Sons, Ltd.

American.—Atlantic—B. C. W.—Calumet & Hecla—Central—C. N. C. —Franklin—K. A. S.—Kearsarge—M. A.—O. A.—O. C.—Osceola —Quincy—Tamarack—Tamarack Junior—Wolverine.

Australian.—Cobar—E. A. C. C.—Hope—Lloyd—N. G. E.—P. C. C.—Wallaroo.

Chilian Ingots.—Lota—Urmeneta.

German.—H. D. K.—H. O. K.—M. R.

Japanese.—(Certified on the assay note not below 99% wet assay.)

(*b*) Electrolytic in cathodes, ingots, cakes or wirebars, and certified on the assay note as not below 99% wet assay.

American.—Balbach—B. E. R.—L. N. S.—N. E. C.

English.—Elliott—Mersey—Lambert—Vivian & Sons.

German.—N. A.

N. B.—All warrants existing on 16th November, 1896, if deliverable according to the then lists, remain as good deliveries.

15th June, 1897.

The Committee of the London Metal Exchange reserve the power of adding to or withdrawing from the above list as they may think fit; but should either power be exercised, a fresh list will be issued.

Principal Cop

(IN ENGLISH TONS

Compiled by HENRY R

	1896		1895		1894	
Algeria	....		35		....	
Argentina	100		150		230	
Australia	11,000		10,000		9,000	
Austria	1,075		1,110		1,810	
Bolivia—Coro/coro	2,000		2.250		2,300	
Canada	4,000		*4,000		*5,000	
Chili	23,500		22,075		21,340	
Cape of Good Hope—Cape Co.	5,470		5,350		5,000	
Namaqua	1,980		1,730		1,500	
England	*500		580		445	
Germany—Mansfeld	18,265		14 860		14,990	
Other German	1,800		1,695		2 210	
Hungary	210		200		310	
Italy	3,400		*2,500		2,600	
Japan	21,000		18,430		20,050	
Mexico—Boleo	9,940		10,450		10,370	
Other Mexican	1,210		1,170		1,400	
Newfoundland—Betts Cove	....		....		100	
Tilt Cove	1,800		1,800		1,800	
Norway—Vigsnaes	....		960		985	
Other Norwegian	2,500		1,725		905	
Peru	740		450		440	
Russia	*5,000		*5,000		5,000	
Sweden	500		515		350	
Spain and Portugal—						
Rio Tinto	33,000	53,325	33,500	54,950	33,000	54,175
Tharsis	12,000		12,000		11,000	
Mason & Barry	*3,900		*4,100		*4,200	
Sevilla	1,025		1,050		1,170	
Other Mines	3,400		4,300		4,805	
United States of America—						
Calumet & Hecla	40,383	203,893	34,454	172,300	27,675	159,695
Other Lake	24,286		23,582		23,450	
Anaconda	55,603		41,983		42,410	
Other Montana	37,673		40,606		37,320	
Arizona	31,548		21,429		19,690	
Other States	14,400		10,246		9,150	
Venezuela—Quebrada	....		....		2,500	
Total	373,208		334,285		324,505	

Those marked with an

Average of Prices of G. M. Bs. on the 1st of each month	£47 4/8	£42 17/6	£40 2/6

per Supplies.

F FINE COPPER.)

ERTON & CO., LONDON.

1893		1892		1891		1890		1889		1888	
....		...		120		120		160		50	
160		200		210		150		190		150	
7,500		6,500		7,500		7,500		8,300		7,450	
1,215		1.100		965		1,210		1,225		1,010	
2,500		2,860		2,150		1,900		*1,200		1,450	
*5,000		*3.500		3,500		3,050		2,500		*2,250	
21,350		22,565		19,875		26,120		24,250		31.240	
5,200		5,500		5,000		5,000		5,600		5,800	
890		450		900		1,450		*2,100		1,700	
425		495		720		935		905		1,456	
14.150		15,360		14,250		15,800		15,506		13,380	
2,000		1,935		1,900		1,825		*1,850		*1,850	
210		285		285		300		300		858	
2,500		2.500		2,200		2,200		*3,500		3,500	
18,000		18,000		17,000		15,000		15,000		11,600	
7,980		6,415		4,175		3,450		3.280		2,566	
500		900		1,025		875		500		200	
240		450		540		735		1,115		1,300	
1,800		1,940		1,500		1,000		1,500		750	
1,070		785		615		925		1,007		1,020	
790		625		632		465		435		300	
460		290		280		150		275		250	
5,000		4,900		4,800		4,800		4,070		4,700	
535		735		655		830		830		1,036	
31,100	53,995	31,500	56,462	32,000	53,915	30,000	51,700	29,500	54,270	28,500	56,450
11,000		*11,500		*10.500		*10,300		*11,000		*11,000	
*4,400		*4,400		*4,150		*5,600		*5,250		*7,000	
1,270		1,070		875		810		1,350		1,700	
6,225		7,992		6,390		4,990		7,170		8,250	
27,675	147,210	32,250	152,620	29,000	128,179	26,250	116,325	21,700	105,774	22.450	101,710
22,835		22,210		22,505		18.200		17,069		16,200	
33,600		45,000		20,750		28,600		27,500		28,225	
35,700		27,000		29,786		20,960		19,018		15,478	
19,600		17,160		17,723		15 945		14,419		14,062	
7.800		9,000		8,415		6.370		6,068		5,295	
2,850		3,100		6,500		5,640		5,563		4,000	
303,530		310,472		279,391		269,455		261,205		258,026	

asterisk are estimated.

£43 6/9	£45 9/6	£51 3/	£54 1/	£49 10/6	£76

Principal Copper

	1887		1886		1885	
Algeria	150		110		250	
Argentina	170		180		233	
Australia	7,700		9,700		11,400	
Austria	883		733		585	
Bolivia—Coro/coro	*1,300		1,100		*1,500	
Canada	1,450		1,560		1,200	
Chili	29,150		35,025		38,500	
Cape of Good Hope—Cape Co	5,950		5,390		5,000	
Namaqua	1,300		625		450	
England	389		1,471		2,773	
Germany—Mansfeld	13,025		12,595		12,450	
Other German	*1,850		*1,870		*2,800	
Hungary	531		366		*600	
Italy	2,500		2,100		*2,000	
Japan	*11,000		*12,000		*10,000	
Mexico—Boleo	1,950		....		....	
Other Mexican	100		250		375	
Newfoundland—Betts Cove	1,180		1,125		778	
Tilt Cove	125		....		....	
Norway—Vigsnaes	1,150		1,920		2,180	
Other Norwegian	275		330		380	
Peru	50		75		229	
Russia	5,000		4,875		5,100	
Sweden	905		520		775	
Spain and Portugal—						
Rio Tinto	28,500	53,706	24,700	49,653	23,484	47,873
Tharsis	*11,000		*11,000		*11,500	
Mason & Barry	*7,000		*7,000		*7,000	
Sevilla	2,300		2,135		1,800	
Other Mines	4,906		4,818		4,089	
United States of America—						
Calumet & Hecla	20,550	79,109	22,550	69,805	21,075	74,050
Other Lake	12,780		13,040		11,135	
Anaconda	25,450		14,850		16,070	
Other Montana	9,775		10,870		14,200	
Arizona	8,035		6,985		10,135	
Other States	2,519		1,510		1,435	
Venezuela—Quebrada	2,900		3,708		4,111	
Total	223,798		217,086		225,592	

Those marked with [illegible]

Average of Prices of G. M. Bs. on the 1st of each month	£42 3/	£40 6/	£44 1/6

pplies—Continued.

1884		1883		1882		1881		1880	
260		*600		*600		*600		*500	
159		293		800		307		*300	
14,100		*12,000		*11,000		10,000		9,700	
670		*500		*455		455		470	
*1,500		1,680		3,259		2,655		*2,000	
1,000		1,055		500		500		50	
41,648		41,099		42,909		37,989		42,916	
5,000		5,000		5,000		5,087		5,038	
....		...		....		....		....	
3,350		2,620		3,464		3,875		3,662	
12,582		12,643		11.516		10,999		9,800	
*2,200		*2.000		*1,800		1,743		1,000	
600		790		660		815		820	
*2,000		*1,600		*1,400		*1,480		*1,380	
10,000		*7 600		*4,800		*3,900		*3,900	
....		....		....		....		....	
291		489		401		333		*400	
668		1,053		1,500		1,718		*1,500	
....		....		...		...		....	
2,390		2,340		2.300		2,350		2,040	
392		322		*290		290		386	
362		395		440		615		*600	
4,700		4,400		4,000		3,700		3.300	
662		732		798		995		1,074	
21.564	46,415	20,472	44,607	17,389	39,560	16,666	39,258	16,215	36,313
10,800		*9,800		*9,000		*10,203		*9,151	
*7,500		*8.000		*8,000		*8,170		*6,603	
2,000		2,026		1,885		1 340		1.705	
4,551		4,309		3,286		2,879		2,639	
18,050	64,700	14,750	51,570	14,300	40,470	13,995	30,882	14,150	25,010
12,875		11,900		11,140		10,355		8,050	
10,265		11,010		4,045		6,532		2,810	
8,990									
11.985		10,660		8,030					
2,585		8,250		2,955					
4,600		4,018		3,700		2.823		1,800	
20,249		199,406		181,622		163,369		153,959	

isk are estimated.

54 15/6 £68 8/9 £67 -/6 £61 1/3 £63 1/3

Copper Production of the World.

SUMMARY.

In tons of 2,240 pounds fine copper.

Country.	1896.	1895.	1894.	1893.
North America	220,843	189,720	178,365	162,730
Europe	86,575	84,095	83,780	81,890
South America	26,340	24,925	26,810	27,320
Asia	21,000	18,430	20,050	18,000
Australia	11,000	10,000	9,000	7,500
Africa	7,450	7,115	6,500	6,090
Total	373,208	334,285	324,505	303,530

Country.	1892.	1891.	1890.	1889.
North America	165,825	138,919	125,435	114,669
Europe	85,182	80,937	80,990	83,898
South America	29,015	29,015	33,960	31,478
Asia	18,000	17,000	15,000	15,000
Australia	6,500	7,500	7,500	8,300
Africa	5,950	6,020	6,570	7,860
Total	310,472	279,391	269,455	261,205

United States Copper Consumption.

Deducting the exports of copper from the production, the quantity left for domestic consumption, during the years given below, was as follows, in tons of 2,240 lbs. of fine copper, viz.:

	Last Half of 1892.	Year 1893.	Year 1894.
United States Production	65,526	142,480	159,623
United States Exports	17,980	80,392	77,131
Left for Home Consumption	47,546	62,088	82,492

	Year 1895.	Year 1896.	First Ten Months of 1897.
United States Production	171,197	203,894	176,388
United States Exports	64,722	125,605	109,334
Left for Home Consumption	106,475	78,289	67,054

Copper and Brass.

From the interesting article contributed by Mr. A. A. Cowles, New York, to the work entitled "One Hundred Years of American Commerce," published by D. O. Haynes & Co. (a valuable work, by the way, for business men to possess), we are, by the courtesy of the publishers of the above work, enabled to give the following extracts.

"The Naugatuck Valley contains a population of more than 80,000 people. . . . . . This is the seat of the brass-rolling industry of America. Ten great corporations are here directly engaged in this business, producing about three-fourths of the total quantity of rolled brass manufactured in the United States, giving direct employment to 8,200 persons, and indirectly to many thousands more. Nearly 100,000,000 pounds of copper, or about one-half the total quantity of this metal consumed in the United States, are conveyed annually to the Naugatuck Valley for use in these manufacturing establishments.

"From Torrington to the head of the valley, to Derby, there is a fall in the Naugatuck River of about 600 feet. Four times, within six miles from the mouth, the water is diverted from its channel by dams, and held in large reservoirs to furnish water-power. . . . . The brass-rolling industry began in this valley 65 years ago. . . . . As time went on and competition increased, the production of rolled metal becoming less profitable, many of the rolling-mills began remanufacturing their own metal. Other corporations were formed, some being direct offshoots from the brass-mills, until the location became what it is to-day—a centre for the reworking and consumption of metal. . . . . .

"The seat of the brass-rolling industry remains to-day where it was established 65 years ago, it being a noteworthy fact that, with hardly an exception, all of the brass-mills which are operated outside of the State of

A. A. COWLES.

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Connecticut were constructed and are carried on by Connecticut men.

"Israel Coe, a farmer of Connecticut, John Hungerford, of Connecticut, and Anson G. Phelps, a capitalist of New York, and founder of the house of Phelps, Dodge & Company, were pioneers in brass manufacturing in this country, and in 1834 they built a brass-mill at Wolcottville, now Torrington, Conn. Previous to 1830 brass was imported, or manufactured in a very primitive way. As early as 1811, James G. Moffett, of New York, rolled brass in small quantities, using for power a sweep actuated by oxen. In 1802 the manufacture of gilt buttons was begun in Connecticut by Abel Porter & Company. At that time these buttons were articles of fashionable use. To obtain brass for this purpose the mixture was cast in ingots at Waterbury, and taken to Bradleyville, near Litchfield, Conn., where there was an iron-mill, driven by water-power; here it was broken down and rolled into strips, and returned in a rough state to the button factory in Waterbury, where it was rolled thinner by being passed between two rolls two inches in diameter, driven by horse-power. The copper for brass-making was obtained from old boilers which had been used in distilleries and in sugar-making.

"This copper was cast into ingots and mixed with spelter, which was obtained from abroad. In 1808 Abel Porter & Company purchased the water-power now owned by the Scovill Manufacturing Company at Waterbury, and soon afterward put in rolls suitable for breaking down and finishing brass. For a period of about twenty years they rolled brass, but it does not appear that their production was any more than enough to supply their own requirements. In 1830 the firm of Holmes, Hotchkiss, Brown & Elton established a mill and engaged in the manufacture of sheet brass at Waterbury. This was substantially the beginning of the sheet-brass business in America, although the metal, in small quantities, may have been occasionally supplied to consumers before that time by the firm of J. M. L. & W. H. Scovill, and by Benedict & Coe, of Waterbury. . . . . .

"Local competition arose, and in 1840 Edwin Hodges, of West Torrington, started a mill for the purpose of making brass kettles, and also for drawing brass wire. This seems to have been the first brass-wire-drawing establishment in this country. It was located in Cotton Hollow, in the town of Torrington. The enterprise was unsuccessful, and the mill was soon closed, with the loss of all the capital invested. . . . . . .

"The name of Anson G. Phelps is perpetuated by the city of Ansonia, the Ansonia Brass and Copper Company, as well as by the firm of Phelps, Dodge & Company, which he founded; and the name of Israel Holmes appears in the title of the corporation of Holmes, Booth & Haydens, of Waterbury.

"The decade from 1840 to 1850 saw the birth of many of the prominent brass-manufacturing corporations of the present day. . . . . . .

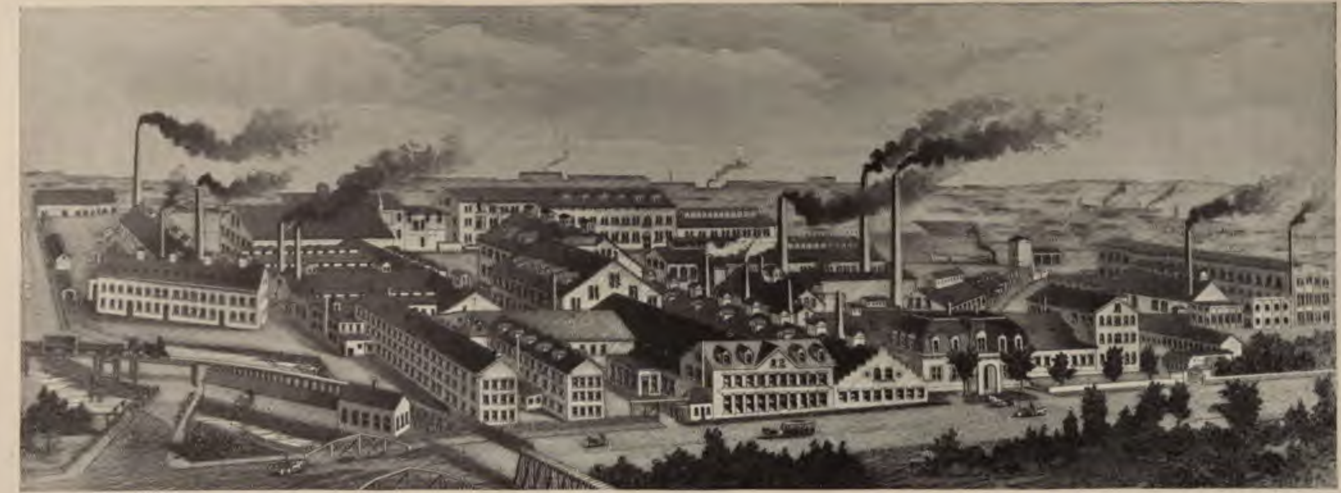
"In 1844 Anson G. Phelps purchased extensive lands in the vicinity of what is now the city of Ansonia, which was founded by him, and named in his honor. He constructed a dam across the Naugatuck River, a canal, large reservoirs for water-power, and built a mill for rolling copper. The firm of Phelps, Dodge & Co. had for some years prior to 1844 operated a copper-rolling-mill at Birmingham, Conn. The water privilege at Ansonia is now owned and operated by the Ansonia Land and Water Company, and is the source of water-power for the city of Ansonia. Mr. Phelps brought from the Wolcottville works J. H. Bartholomew and George P. Cowles, who managed the business at Ansonia, under the name of the Ansonia Brass and Battery Company, the term 'battery' being indicative of the process by which brass kettles were hammered from metal blanks. This method of making kettles was in use until 1851, when it gave place to a patented process for spinning kettles from circular blanks of metal. The business of the Ansonia Brass and Battery Company was conducted by the firm of Phelps, Dodge & Company, of New York. A brass-mill was built, and later a wire-mill. The company afterward engaged in the manufacture of clocks. In 1869 this manufacturing enterprise was incorporated under the name of The Ansonia Brass and Copper Company.

In 1877 the manufacture and sale of clocks had increased to such an extent that it was decided to form a new joint-stock corporation under the name of the Ansonia Clock Co., which began business on January 1, 1878. The location of this part of the company's business was transferred to Brooklyn, N. Y., where large factories were erected, and are now in operation. The ownership and management of the two companies are practically the same. They operate at Ansonia four factories, where they give employment to 1,125 persons, and in the factories in Brooklyn 1,000 persons are employed. They manufacture at Ansonia sheet brass, sheet copper, wire, tubing, etc. They also remanufacture their metal, making brass bedsteads and other articles. . . . The nominal capital invested in 27 corporations engaged in the manufacture of rolled brass, copper and wire is $12,137,000, but the amount of the actual investment is about $28,000,000. The number of persons employed is 14,350."

Brass and Copper Manufacturers.

Connecticut is famous for its industrial enterprise, and Waterbury is noted for its manufacture of copper and brass goods in all their varied forms. The Naugatuck Valley, in fact, is studded with mills and plants for the consumption of copper, so extensive and immense, that it holds the position of being the leading centre of brass and copper manufactures in the country. The manufactured product of these interests is shipped and distributed to every part of the land, and to foreign countries as well.

The relations between capital and labor in Waterbury and the Naugatuck Valley have been sympathetically friendly and remarkably free from strikes. Such a fact must certainly be gratifying to all concerned.



WORKS OF BENEDICT & BURNHAM MANUFACTURING CO., WATERBURY, CONN.

Benedict & Burnham Mfg. Company,

WATERBURY, CONN.

Benedict & Burnham Mfg. Co. may be said to have originated in 1812, when Aaron Benedict commenced the manufacture of buttons. In 1823, Mr. Benedict became connected with Bennett Bronson, of Waterbury, Nathan Smith, William Bristol, and David C. DeForest, under the firm name of A. Benedict, with a capital of $6,500. In 1827, the partnership was renewed, and capital increased to $13,000. When this second partnership expired, February 2, 1829, a new one was formed under the name of Benedict & Coe, with a capital of $20,000. Mr. Benedict's partners were Israel Coe, Bennett Bronson, Benjamin DeForest, Alfred Platt and James Croft. Up to this time the manufacturers of brass had sent their ingots to an iron mill in the west part of Litchfield, to be rolled into sheets or strips, but the new concern undertook to do its own rolling, and from that time onward, rolled brass for the market.

On February 10, 1834, the copartnership of Benedict & Coe expired, and a new firm with a capital of $40,000 was established, under the name of Benedict & Burnham. The partners were Aaron Benedict, Gordon W. Burnham, Bennett Bronson, Alfred Platt, Henry Bronson, Samuel S. DeForest and John DeForest. This copartnership was renewed March 16, 1838, with a capital of $71,000; again, on March 11, 1840, with a capital of $100,000. On January 14, 1843, it gave place to the Benedict & Burnham Mfg. Co., the first joint-stock corporation formed in the town of Waterbury, with a capital of $100,000, which was increased in 1848 to $200,000, and in 1856 to $400,000. This amount must be multiplied several times to represent the value of buildings covering a space of a dozen acres, and containing costly machinery producing annually many million pounds of metal.

Since 1824, the business of the company has steadily increased in volume and variety. It produces copper and all the alloys of copper, brass, gilding metal and German silver in sheets and wire of all sizes; brazed and seamless tubing of brass and copper, insulated and hard drawn copper wire for electrical purposes, lamp burners, safety pins, drop handles and metal trimmings for furniture, and a great variety of brass articles too various to enumerate.

Benedict & Burnham Mfg. Co. has from time to time become the parent of other joint-stock companies. Whenever a branch of its business could be better carried on separately, property necessary for its prosecution has been detached, and distributed as a dividend to stockholders in the form of stock in a new company. Thus originated in 1846 the American Pin Co., with $50,000 capital, afterwards increased to $100,000, other parties being associated with Benedict & Burnham Mfg. Co. in the formation of the concern. In 1849, the Waterbury Button Co., with a capital of $30,000, afterwards increased to $45,000. In 1852, the Benedict & Scovill Co., a mercantile corporation with a capital of $50,000, afterwards increased to $60,000, the Scovill Mfg. Co. being associated with Benedict & Burnham Mfg. Co. in this enterprise. In 1857, the Waterbury Clock Co., with $60,000 capital, afterwards increased to $100,000. The Waterbury Watch Co. owes its existence to the Benedict & Burnham Mfg. Co., whose officers were largely instrumental in its formation in 1880. Benedict & Burnham still retains controlling interest in this concern.

The officers of the company, from the date of its incorporation, are as follows:

Presidents:	Aaron Benedict,	1843–1873,
	Charles Benedict,	1873–1881,
	Gordon W. Burnham,	1881–1885,
	Charles Dickinson,	1885–1888,
	Augustus S. Chase,	1888–1896,
	E. L. Frisbie, Jr., since 1896.	

Treasurers : Aaron Benedict, 1843-1854,
Charles Benedict, 1854-1881,
Charles Dickinson, 1881-1885,
Edward L. Bronson, 1885-1890,
Edw'd L. Frisbie, Jr., 1890-1896,
W. A. Hungerford, during portions of the years 1896 and 1897.
E. L. Frisbie, Jr., since the death of Mr. Hungerford in 1897.

Secretaries : John S. Mitchell, 1843-1850,
Charles Benedict, 1850-1866,
Charles Dickinson, 1866-1881,
Edward L. Bronson, 1881-1885,
E. L. Frisbie, Jr., 1885-1890,
A. M. Dickinson, since 1890.

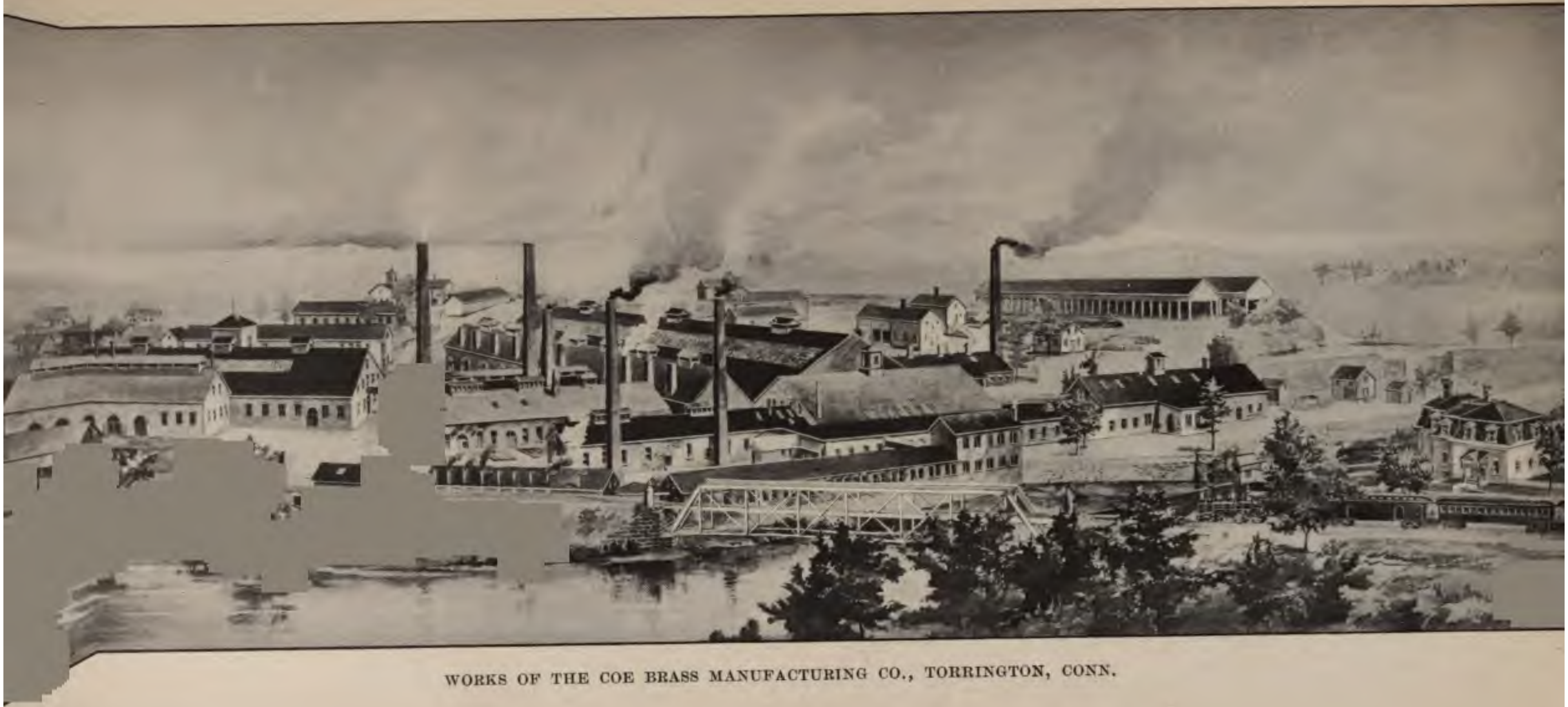
ssistant Treasurers : Charles L. Stocking, 1891-1893,
Gordon W. Burnham (grandson of the associate founder of the corporation) since 1896.

The Coe Brass Manufacturing Company.

Among the many prominent brass mills of the country, the Coe Brass Manufacturing Company holds a distinguished position, being the largest producer of brass in the United States. The extensive plant of this company is situated in Torrington, Connecticut, where well-adapted, substantial buildings are located on both sides of the Naugatuck River, for the manufacture of various descriptions of metal goods by the Coe Brass Mfg. Co.

The foundation of this great industrial concern was laid early in the century by Mr. Israel Coe, who, having obtained a mill privilege in Torrington, entered into a partnership with Mr. Israel Holmes for the manufacture of brass kettles. The business was continued on a partnership basis until 1842, when the Wolcottville Brass Co. was organized, with the late Lyman W. Coe as Secretary and Treasurer. After holding that official position three years, Mr. Coe moved to Waterbury, where he founded the Waterbury Brass Co. In 1863 he returned to Torrington again, bought out the Wolcottville Brass Company's plant, and organized the Coe Brass Manufacturing Company. The capital stock was made $100,000, and the new company entered upon the manufacture of brass wire and rods, German silver and brass rolling.

The company has enjoyed marked prosperity, and has gone on successfully increasing its business and enlarging its facilities, until it has a plant equipped with costly machinery and modern devices for the manufacture of its specialties. Some of this machinery is required to be of peculiar accuracy and precision, and is so finely adjusted that it can turn out sheets of metal ten one-thousandths of an inch in thickness. The company manufactures brazed and seamless tubes, the different varieties of



WORKS OF THE COE BRASS MANUFACTURING CO., TORRINGTON, CONN.

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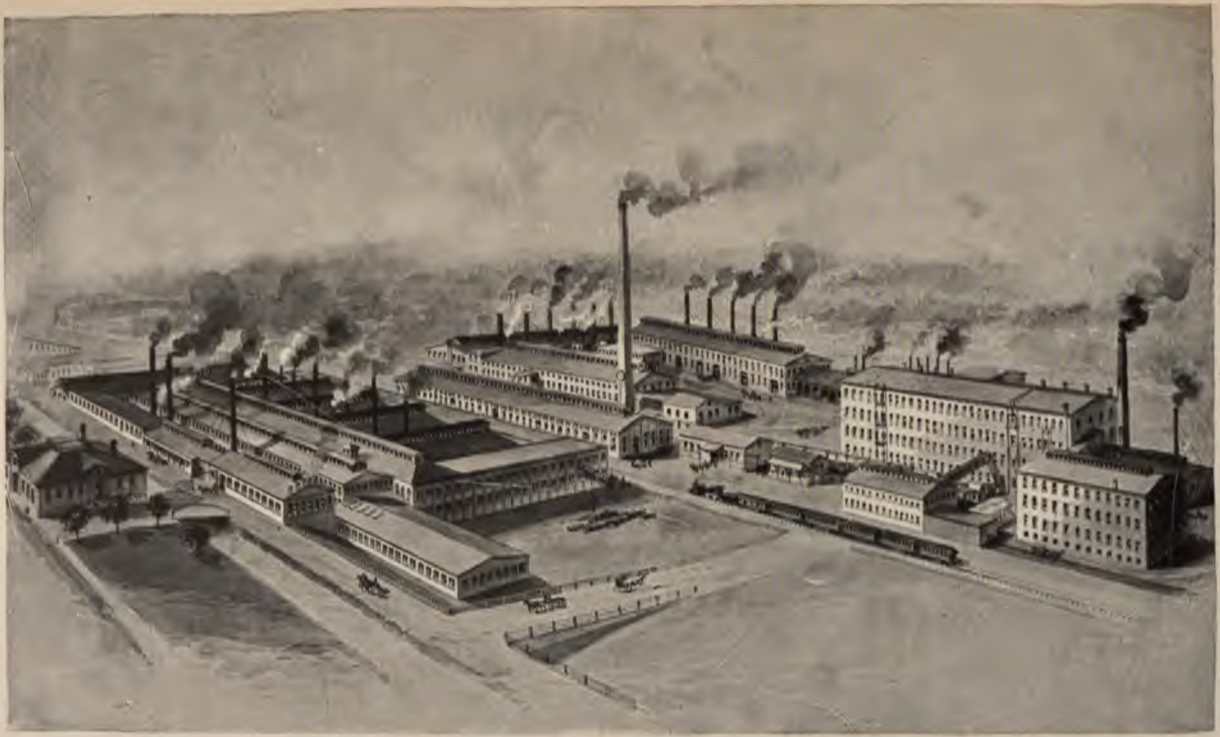

BRANCH OF THE COE BRASS MANUFACTURING CO. AT ANSONIA, CONN.

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sheets, rolls, plates, and wire of copper, brass and German silver. About thirty acres are occupied by the Coe Brass Mfg. Co.'s buildings at Torrington, fitted with private water and electric plants and other modern improvements. Last year the company purchased the Ansonia plant of the late firm of Wallace & Sons, thereby increasing its capacity as well as its resources. The capital stock at present is $325,000. The officials of the company are C. F. Brooker, President; E. T. Coe, Treasurer, and James Doughty, Secretary. After holding the office of Secretary of the Coe Brass Manufacturing Company from 1870 to 1893, Mr. Brooker became President of the corporation on the death of the late Lyman W. Coe in 1893, and he is now the official head and representative of the company. He also holds official relation to other institutions and corporations, and was a member of the State Senate of Connecticut in 1893–4.

Randolph & Clowes.

The firm of Randolph & Clowes is a partnership arrangement, and their works are located near the centre of the city of Waterbury, Conn. Their mills and plant cover seven acres of ground, with the tracks of the New York & New England Railroad fronting on one side, and the rails of the New York, New Haven & Hartford Road passing on another side, while from the Naugatuck River, flowing southward, near by, they have unlimited and never-failing supplies of water.

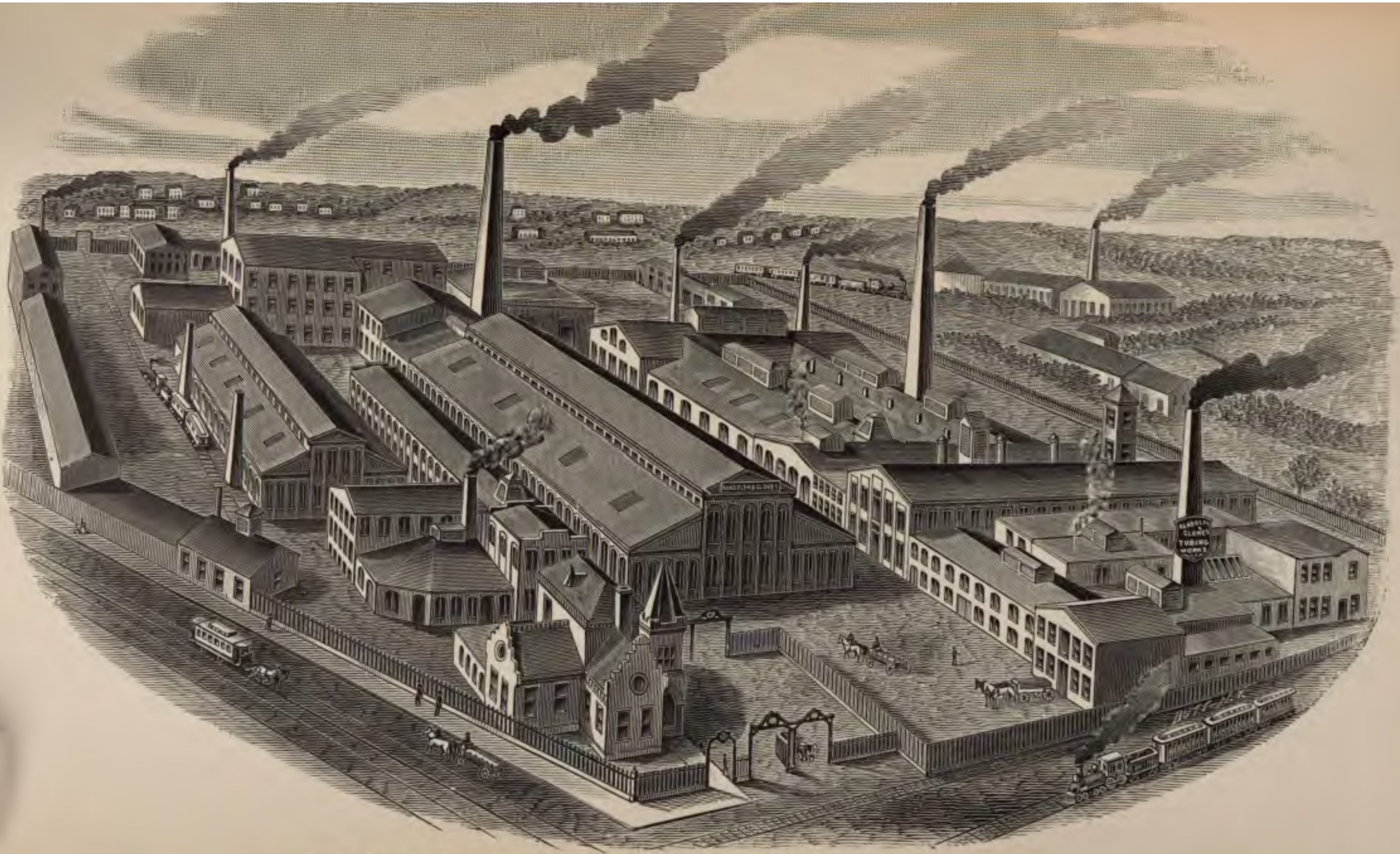
Randolph & Clowes are successors of the late Brown & Bros., who at one time were a solid and powerful company, but which became extinct in the commencement of 1886. In April, 1886, Randolph & Clowes purchased that portion of the plant secured, from the trustees of the former Brown & Bros., for $42,000.

When Randolph & Clowes came into possession, the responsibilities of conducting the operations of the firm and direction and management of the plant devolved on Mr. Clowes, who is the efficient general manager and superintendent of the concern.

On commencing operations the firm employed fifty men and one clerk, with very limited office quarters. Recently there were in the neighborhood of four hundred and fifty to five hundred hands employed, and several under-superintendents. In striking contrast to the office quarters of the firm ten years ago, the main office to-day is located in a substantial and beautiful brick structure, having, we understand, twenty clerks employed. The firm has offices in Boston and Chicago, and branch offices in New York, Philadelphia and Cincinnati.

In 1889 Randolph & Clowes succeeded in purchasing from the trustees of Brown & Bros. the rolling mill

GEORGE H. CLOWES.



MILLS, FACTORIES AND OFFICES OF RANDOLPH & CLOWES, WATERBURY, CONN.

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property of the old firm at a cost of $75,000—a price very much less than what it had been obstinately held at for a long time.

Starting with about two hundred customers, the firm is recently said to have nearly five thousand in all parts of the world. Over $600,000, it is also stated, have been expended in improving the property as originally purchased. The cost, therefore, of the company's plant, starting in such modest proportions, is to the partners of the firm figured to be over $700,000.

Waterbury Brass Company,

WATERBURY, CONN.

This company was organized in April, 1845, with Israel Holmes as President, S. B. Minor, Secretary, and Timothy Porter, Treasurer. Lyman W. Coe became Secretary soon after. Its capital was $50,000, which was increased to $75,000 in 1848, to $104,000 in 1850, in 1852 to $208,000, and in 1853 to $250,000. A new factory was built in 1852. In 1853 Lyman W. Coe succeeded Israel Holmes as President. In 1855 John P. Elton was made President, and L. W. Coe, Secretary and Treasurer. In 1857 the capital was again increased to $300,000. Calvin H. Carter was elected President in 1865, to fill the vacancy caused by the death of Mr. Elton. In 1865 the capital stock was again increased to $400,000, which sum is its present capital. Jos. C. Welton was President of the company from 1870 to 1874, and was succeeded by Jas. S. Elton, the present incumbent.

A few years ago this company extended their plant by erecting new, substantial and attractive brick buildings in Waterbury. Altogether, the group of factories and mills with main offices of the company form a complete, extensive and handsome plant in every particular. Their manufactures consist of sheet and roll brass of all dimensions, German silver, brass and copper tubing, copper rivets and bars, brass kettles, percussion caps of all kinds, and other goods, including an endless variety of small brass wares of different descriptions. The company has stores at 60 Centre Street, New York City; 38 Mechanic Street, Newark, N. J., and 125 Eddy Street, Providence, R. I.

The present officers of the Waterbury Brass Company are:

JAMES S. ELTON, *President.*
EDWARD D. STEELE, *Treasurer.*
JOHN P. ELTON, *Assistant Treasurer.*
GILMAN C. HILL, *Secretary.*

Holmes, Booth & Haydens.

The Holmes, Booth & Haydens Company, of Waterbury, Conn., with New York salesroom, 37 Park Place, is one of the oldest and largest brass manufacturers in the United States; was organized February 2, 1853, with Israel Holmes as President, and John C. Booth as Secretary and Treasurer.

In the beginning the business was principally the manufacture of sheet brass. Many additions have been made to the plant from time to time, and different lines of goods in brass and copper have been added on a large scale, such as brass and copper rods and wire, seamless and brazed tubing, rivets and burs, plumbers' chains, jack chains, kerosene lamps, burners and trimmings, bare and insulated electric wires of all kinds, and at the present time all of these goods are manufactured by them in large quantities.

This company was the first to manufacture planished copper-silver plates for daguerreotyping. At the time kerosene oil was discovered and found useful for lighting, this company added largely to its plant for the purpose of manufacturing kerosene lamps, burners and trimmings for same, and from the beginning until the present time have been one of the leading lamp and burner manufacturers of this country.

More recently, when electricity was introduced for lighting and power purposes, this company increased the facilities of their plant to accommodate this branch of the business, and have from the first been leaders in furnishing bare and insulated wires of all kinds for electrical purposes.

The present officers of the company are Thos. B. Kent, President and Treasurer; T. B. Burnham, Vice-President; F. L. Adams, Assistant Treasurer; and George H. Benham, Secretary, with chief offices at Waterbury, Connecticut, U. S. A.

Variations in Prices.

The following table shows the differences in values, caused by the variations in the price per pound on the quantities of copper stated, viz.:

Per Pound.	Quantity, Pounds.	Amounts to	Long Tons.	Amounts to
.02½c.	25,000	$ 6 25	25	$ 14 00
.05	"	12 50	"	28 00
⅛	"	31 25	"	70 00
¼	"	62 50	"	140 00
½	"	125 00	"	280 00
¾	"	187 50	"	420 00
1	"	250 00	"	560 00
.02½	50,000	12 50	50	28 00
.05	"	25 00	"	56 00
⅛	"	62 50	"	140 00
¼	"	125 00	"	280 00
½	"	250 00	"	560 00
¾	"	375 00	"	840 00
1	"	500 00	"	1,120 00
.02½	100,000	25 00	100	56 00
.05	"	50 00	"	112 00
⅛	"	125 00	"	280 00
¼	"	250 00	"	560 00
½	"	500 00	"	1,120 00
¾	"	750 00	"	1,680 00
1	"	1,000 00	"	2.240 00

English and French Copper Statistics.

The following estimates show the movement of copper in England and France, in tons fine of 2,240 pounds :

	1896.	1895.	1894.	1893.	1892.	1891.
Consumption in England..	89,191	62,692	61,380	66,817	48,367	59,223
Consumption in France....	40,322	30,658	26,879	36,142	24,928	31,137
Imported into England....	135,856	119,941	125,009	129,832	134,371	138,616
Exported from England...	59,334	65,990	54,689	70,986	82,542	76,056
Imported into France......	36,358	22,795	18,047	25,579	9,374	14,889
Deliveries Eng. and France.	148,245	106,205	96,141	127,217	105,937	119,836
Visible supply Dec. 31st...	34,930	45,837	54,683	47,273	55,679	56,015
Chili Bars or G. M. B.—						
Highest..........	£50.8.9	47.8.9	43	46.16.3	48	56.10
Lowest..........	£40.10.0	38.13.9	37.17.6	40.12.6	43.7.6	44.1.3

EUROPEAN VISIBLE SUPPLY.

Total estimated visible supply of copper in England and France, and afloat thereto, from Chili and Australia, in tons of 2,240 pounds:

	1890.	1889.	1888.	1887.	1886.	1885.
On December 31st.........	65,366	98,847	104,091	42,301	63,290	58,170

From January 1, 1866, to January 1, 1884, stocks of copper in England and France, and afloat thereto, from Chili, ranged between the extremes of 27,500 tons January, 1866, to 54,600 tons August, 1880. During the same periods the highest price for Chili bars was £108 per ton, and the lowest £53 per ton.

Foreign Weights and Measures

REDUCED TO

UNITED STATES EQUIVALENTS.

The more prominent countries where the French metric system is the legalized standard in use are Austria, Chili, Germany, Italy and Spain. The system can also be lawfully used in this country and Great Britain, but it is not obligatory in the two latter countries. We give the equivalents of the weights and measures more commonly used, viz.:

1 Kilogramme = 1,000 Grammes = 2.2046 Pounds.
1 Quintal = 100,000 “ = 220.46 “
1 Tonneau = 1,000,000 “ = 2,204.6 “
1 Metre (1,000 Millimetres) = $39\frac{87}{100}$ Inches.
1 Millimetre = 0.0394 “

OTHER EQUIVALENTS.

1 Spanish Arroba = 25 Spanish Pounds = $25\frac{36}{100}$ Avoirdupois Pounds.
1 Russian Pood = 36.112 “
1 Picul (China and Japan) = $133\frac{1}{3}$ “
1 Oke (Greece) = $2\frac{84}{100}$ “
1 Libra (Chili) = 1.014 “
1 Cwt. (British) = 112 “

London Quotations and Equivalents.

London prices of copper and the equivalents in United States currency, with the rate of exchange to the pound sterling, as indicated below. The usual discount of 2½ per cent., deducted from price of copper in London, is equivalent to sixpence per £ sterling, but the discount is not deducted from these calculations.

Rate of Exchange, $4.82.			Rate of Exchange, $4.83.		
Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.	Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.
£38	=	8.17c.	£38	=	8.19c.
39	=	8.39	39	=	8.40
40	=	8.60	40	=	8.62
41	=	8.82	41	=	8.84
42	=	9.03	42	=	9.05
43	=	9.25	43	=	9.27
44	=	9.46	44	=	9.48
45	=	9.68	45	=	9.70
46	=	9.89	46	=	9.91
47	=	10.11	47	=	10.13
48	=	10.32	48	=	10.35
49	=	10.54	49	=	10.56
50	=	10.76	50	=	10.78
51	=	10.97	51	=	10.99
52	=	11.18	52	=	11 21
53	=	11.40	53	=	11.42
54	=	11.61	54	=	11.64
55	=	11.83	55	=	11.85
56	=	12.05	56	=	12.07
57	=	12.26	57	=	12.29
58	=	12.48	58	=	12.50
59	=	12.69	59	=	12.72
60	=	12.91	60	=	12.93
61	=	13.12	61	=	13.15
62	=	13.34	62	=	13.36
63	=	13.55	63	=	13.58
64	=	13.77	64	=	13.80
65	=	13.98	65	=	14.01

LONDON QUOTATIONS AND EQUIVALENTS—CONTINUED.

Rate of Exchange, $4.84.			Rate of Exchange, $4.85.		
Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.	Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.
£38	=	8.21c.	£38	=	8.22c.
39	=	8.42	39	=	8.44
40	=	8.64	40	=	8.66
41	=	8.85	41	=	8.87
42	=	9.07	42	=	9.09
43	=	9.29	43	=	9.31
44	=	9.50	44	=	9.52
45	=	9.72	45	=	9.74
46	=	9.93	46	=	9.95
47	=	10.15	47	=	10.17
48	=	10.37	48	=	10.39
49	=	10.58	49	=	10.60
50	=	10.80	50	=	10.82
51	=	11.01	51	=	11.04
52	=	11.23	52	=	11.25
53	=	11.45	53	=	11.47
54	=	11.66	54	=	11.69
55	=	11.88	55	=	11.90
56	=	12.09	56	=	12.12
57	=	12.31	57	=	12.34
58	=	12.53	58	=	12.55
59	=	12.74	59	=	12.77
60	=	12.96	60	=	12.99
61	=	13.18	61	=	13.20
62	=	13.39	62	=	13.42
63	=	13.61	63	=	13.64
64	=	13.82	64	=	13.85
65	=	14.04	65	=	14.07

LONDON QUOTATIONS AND EQUIVALENTS—CONTINUED.

Rate of Exchange, $4.86.			**Rate of Exchange, $4.87.**		
Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.	Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.
£38	=	8.24c.	£38	=	8.26c.
39	=	8.46	39	=	8.47
40	=	8.67	40	=	8.69
41	=	8.89	41	=	8.91
42	=	9.11	42	=	9.13
43	=	9.32	43	=	9.34
44	=	9.54	44	=	9.56
45	=	9.76	45	=	9.78
46	=	9.98	46	=	10.00
47	=	10.19	47	=	10.21
48	=	10.41	48	=	10.43
49	=	10.63	49	=	10.65
50	=	10.84	50	=	10.87
51	=	11.06	51	=	11.08
52	=	11.28	52	=	11.30
53	=	11.49	53	=	11.52
54	=	11.71	54	=	11.74
55	=	11.93	55	=	11.95
56	=	12.15	56	=	12.17
57	=	12.36	57	=	12.39
58	=	12.58	58	=	12.61
59	=	12.80	59	=	12.82
60	=	13.01	60	=	13.04
61	=	13.23	61	=	13.26
62	=	13.45	62	=	13.47
63	=	13.66	63	=	13.69
64	=	13.88	64	=	13.91
65	=	14.10	65	=	14.13

LONDON QUOTATIONS AND EQUIVALENTS—Continued.

Rate of Exchange, $4.88.			Rate of Exchange, $4.89.		
Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.	Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.
£38	=	8.27c.	£38	=	8.29c.
39	=	8.49	39	=	8.51
40	=	8.71	40	=	8.73
41	=	8.93	41	=	8.95
42	=	9.15	42	=	9.16
43	=	9.36	43	=	9.38
44	=	9.58	44	=	9.60
45	=	9.80	45	=	9.82
46	=	10.02	46	=	10.04
47	=	10.23	47	=	10.26
48	=	10 45	48	=	10.47
49	=	10.67	49	=	10.69
50	=	10.89	50	=	10.91
51	=	11.11	51	=	11.13
52	=	11.32	52	=	11.35
53	=	11.54	53	=	11.57
54	=	11.76	54	=	11.78
55	=	11.98	55	=	12.00
56	=	12.20	56	=	12.22
57	=	12.41	57	=	12.44
58	=	12.63	58	=	12.66
59	=	12.85	59	=	12.87
60	=	13.07	60	=	13.09
61	=	13.28	61	=	13.31
62	=	13.50	62	=	13.53
63	=	13.72	63	=	13.75
64	=	13.94	64	=	13.97
65	=	14.16	65	=	14.18

ONDON QUOTATIONS AND EQUIVALENTS—CONTINUED.

Rate of Exchange, $4.90.

Price per Ton of 2,240 Lbs. London.		Equal to Price per Lb. U. S. Currency.
£38	=	8.31c.
39	=	8.53
40	=	8.75
41	=	8.96
42	=	9.18
43	=	9.40
44	=	9.62
45	=	9.84
46	=	10.06
47	=	10.28
48	=	10.50
49	=	10.71
50	=	10.93
51	=	11.15
52	=	11.37
53	=	11.59
54	=	11.81
55	=	12.03
56	=	12.25
57	=	12.46
58	=	12.68
59	=	12.90
60	=	13.12
61	=	13.34
62	=	13.56
63	=	13.78
64	=	14.00
65	=	14.21

A CONDENSED LEXICON OF MINING WORDS AND TERMS.

Adit—The horizontal opening by which a mine is entered.

Agglutinate—To unite, or cause to adhere.

Amygdaloid—A variety of trap or basaltic rock containing small cavities, occupied wholly or in part by nodules, or geodes of different minerals.

Analysis—The separation of a compound by chemical processes into its constituents.

Anode—A plate of crude copper connected to the positive pole in an electrolytic bath. Crude metal, usually cast in plates and suitable for the process of electrolytic refining.

Argentiferous—Containing, or affording, silver.

Argillaceous—A sandstone containing much clay.

Arseniate—A salt formed by arsenic acid combined with any base.

Assay—The determination of the quantity of any particular metal in an ore.

Black Copper—Resmelted copper matte containing from 97 to 98 per cent. copper; blister copper.

Blende—An ore of zinc.

Bornite—A metallic, reddish-brown, brittle copper-iron sulfid.

Calcareous—Partaking of the nature of limestone, or carbonate of lime.

Calcine—To reduce to a powder, or to a friable state, by the action of heat.

Carbon—An elementary substance, not metallic in nature, which predominates in all organic compounds.

Carbonate—A salt formed by the union of carbonic acid with a base.

Cathode—A plate of copper connected to the negative pole in an electrolytic bath: metal that has been refined by the electrolytic process, usually sold in original plates or sheets without remelting.

Chalcocite—A metallic, blackish, lead-gray copper sulfid.

Chalcopyrite—A metallic, brass-yellow copper sulfoferrite, called also copper pyrites.

Concentrate—To separate ore or metal from its containing rock or earth.

Conglomerate—A rock composed of pebbles cemented together by another mineral substance, either calcareous, silicious, or argillaceous.

Copperas—Sulphate of iron, or green vitriol.

Cupreous—Consisting of copper, or resembling copper; coppery.

Deoxidation—The act or process of reducing from the state of an oxide.

Drift—A passage driven or cut between shaft and shaft; to follow a vein; to prospect.

Electrolyte—A solution of sulphate of copper employed in making electrolytic copper.

Empirical—Pertaining to, or founded upon, experiment or experience.

Epidote—An aluminum calcium silicate.

Ferruginous—Partaking of iron; containing particles of iron.

Fissure Vein—A vein of ore lying in a fissure.

Fluorine—A white crystalline contained in coal-tar.

Flux—Any substance or mixture used to promote the fusion of metals or minerals.

Fluxing Ore—A substance, as borax, or an alkaline that promotes the fusing of minerals or metals.

Gangue—The mineral substance which encloses any metallic ore in the vein, without being combined with it.

Globules—Small particles of matter, of a spherical form.

Gneiss—A crystalline rock.

Gossan—Decomposed rock.

Granite—A crystalline, unstratified rock.

Hematite—An important ore of iron, the sesqui-oxide.

Hornblende—A mineral consisting of silica combined with magnesia, lime, or iron.

Igneous—Resulting from the action of fire; as, lavas or basalt are igneous rocks.

Laumonite—A mineral, usually transparent or translucent.

Level—A horizontal gallery excavated in a mine at different depths.

Lode—A metallic vein.

Malachite—Native carbonate of copper.

Matrix—The earthy or stony substances in which metallic ores or crystalline minerals are found; the gangue.

Matte—Crude black copper reduced, but not refined from sulphur, etc.

Metalliferous—Producing metals.

Metallography—An account of metals, or a treatise on metallic substances.

Metallurgy—The art of working metals.

Metamorphic—Pertaining to certain changes which minerals or rocks may have undergone since their original deposition.

Mundic—Iron pyrites, or arsenical pyrites.

Ochreous—Consisting of ochre.

Ore—A natural mineral substance from which the metal can be profitably extracted.

Outcrop--The coming out of a stratum to the surface of the ground.

Oxide—A compound of oxygen and a base destitute of acid and salifying properties.

Peroxide—That oxide of a given base which contains the greatest quantity of oxygen.

Placer—A gravelly place where gold is found.

Porphyry—A rock consisting of a compact base, usually feldspathic, through which crystals of feldspar are disseminated.

Prehnite—A pale-green mineral of a vitreous lustre.

Pyrites—A combination of sulphur with iron, copper, cobalt, or nickel.

Quartz—Pure silex, occurring in pellucid, glassy crystals.

Reduction—The operation of separating a metal from other substances with which it is combined.

Reverberatory—A furnace so constructed that by means of a dome or low, arched roof, the flame, in passing from the fire-chamber to the chimney, is reflected or reverberated upon the bed or sole over which the material to be operated on by the flame is spread.

Scoria—The recrement of metals in fusion; dross.

Shaft—A well-like excavation in the earth, perpendicular or nearly so, made to reach ore, and to raise this to the surface.

Silica—Silicic acid in a state of purity.

Silicate—A salt composed of silicic acid and a base.

Slag—The dross or recrement of a metal; also vitrified cinders.

Spar—Any earthy mineral that breaks with regular surfaces; a crystallized earthy mineral of a shining lustre.

Stope—A horizontal bed or layer forming one of a series of steps, into which the upper surface of an excavation is cut.

Strata—A bed of earth or rock of any kind formed by natural causes, and consisting usually of a series of layers.

Sub-sulphate—A sulphate with an excess of the base.

Sulphide—A compound of sulphur with another element; a sulphuret.

Sulphur—A simple mineral substance, brittle, insoluble in water.

Sulphurous—Consisting of sulphur.

Talc—A soft magnesian mineral, of a soapy feel.

Talcose—Pertaining to, composed of, or resembling talc.

Trap—A heavy, igneous rock, of a greenish-black or grayish color, consisting of an intimate mixture of feldspar and hornblende or pyroxene.

Vein—A seam or layer of any substance, more or less wide, intersecting a rock or stratum, and not corresponding with the stratification.

Vitriol—Sulphuric acid.

Winze—A small shaft sunk from one level to another for the purpose of ventilation.

Copper Statistics, England and France.

Stocks of copper in England and France, and afloat thereto, from Chili Australia, European deliveries of copper, and reported sales of G. M. Bs. fo months named, as follows, in tons of 2,240 lbs.:

Month Ending		Visible Supply.	Total Deliveries.	Sales G.M.Bs.	Month Ending		Visible Supply.	Total Deliveries.	S G.
January,	1897	32,307	18,307	24,425	January,	1896	46,128	15,328	32
February	"	30,859	14,879	18,900	February	"	43,481	15,068	36
March	"	33,224	17,553	22,875	March	"	39.980	20,935	31
April	"	33,798	19,026	17,200	April	"	38,446	18,960	24
May	"	33,688	19,445	21,425	May	"	36,901	17,312	26
June	"	32,687	19,031	14,250	June	"	36,279	15,425	33
July	"	34,004	20,297	18,850	July	"	34,199	19,467	25
August	"	33,267	20,396	15,700	August	"	35,374	17,936	24
September	"	33,759	17,641	17,625	September	"	34,069	17,753	19,
October	"	34,389	20,933	20,000	October	"	35,441	16,020	25,
					November	"	34,779	20,915	27,
					December	"	34,927	21,427	19,

Month Ending		Visible Supply.	Total Deliveries.	Sales G.M.Bs.
January,	1895	54,848	12,656	9,650
February	"	55,190	8,369	11 350
March	"	53,335	12,011	11,450
April	"	54,239	12,102	17,075
May	"	54,211	9,703	51,150
June	"	58,182	15,973	20,550
July	"	57,817	12,542	30,175
August	"	55,432	12,622	28,450
September	"	52,843	11,060	21,100
October	"	50,383	13,579	32,075
November	"	45,731	14,827	27,850
December	"	45,817	14,527	20,850

Notes.

Montana produces more copper than any other district in the world. It contains 146,080 square miles, or some 92,016,640 acres, and was admitted to the Union in 1889. The name signifies the Land of Mountains. Returns of production in that State for 1896 give a copper output of 103,614 long tons, or slightly over one-half the total United States production, and 27½ per cent. of the entire world's estimated output last year.

Arizona increased its output of copper last year about 25,000,000 pounds compared with 1895. It has an area of 113,020 square miles, or over 72,000,000 acres. Not a mile of railroad was laid in that Territory until 1878, in which year the first 30 miles were constructed. The Southern Pacific crosses Arizona from west to east. The mountain ranges abound in mineral-bearing deposits.

Alaska was purchased by the United States Government from Russia, in 1867, for $7,000,000. That Territory embraces about 550,000 square miles.

The United States, including Alaska, has a computed area of 3,602,990 square miles. Recent statistics show that there are yet some 650,000,000 acres of public lands in twenty Western States. Estimates give 54,400,211 acres of public lands in Arizona, and 71,432,917 acres of public lands in Montana.

The electric light and the Bell telephone were on exhibition at the Centennial Fair in 1876.

In 1883 electric lights began to come into more general use, and electric street cars in 1889.

The first electric telegraph line in the United States was completed between Baltimore and Washington in 1844

There are hundreds of silver mines which have been opened up in Montana, but the low price of silver has restricted operations for this metal.

Personal Photographs Described.

The gentlemen whose photographs appear in this work are the official representatives of the copper mining and metal interests hereinafter designated, viz.:

JOHN STANTON, Secretary and Treasurer of the Atlantic and Central Mining Companies, and President of the Wolverine Copper Mining Co.

LEONARD LEWISOHN, of the firm of Lewisohn Brothers, copper mining companies' agents.

THOMAS F. MASON, President of the Quincy Mining Co.

WILLIAM R. TODD, Secretary and Treasurer of the Quincy Mining Co.

ADOLPH LEWISOHN, of the firm of Lewisohn Brothers, copper mining companies' agents.

J. R. STANTON, Secretary and Treasurer of the Wolverine Copper Mining Co.

ROBERT M. THOMPSON, President of the Orford Copper Co.

A. A. COWLES, Vice-President of the Ansonia Brass & Copper Co.

GEORGE H. CLOWES, General Manager and Superintendent of Randolph & Clowes.

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ISLE ROYALE CONSOLIDATED MINING COMPANY,
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ATLANTIC MINING CO.

OF MICHIGAN.

PRODUCERS OF LAKE COPPER.

JOSEPH E. GAY, President.
JOHN STANTON, Secretary and Treasurer.

MINE OFFICE:

Atlantic Mine P. O., Houghton Co., Mich.

WOLVERINE COPPER MINING CO.

OF MICHIGAN.

PRODUCERS OF LAKE COPPER.

JOHN STANTON, President.
J. R. STANTON, Secretary and Treasurer.

MINE OFFICE:

Allouez P. O., Keweenaw Co., Mich.

JOHN STANTON,

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SOLE AGENT FOR BOTH COMPANIES.

QUINCY MINING COMPANY.

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THOMAS F. MASON,	PRESIDENT.
T. HENRY MASON,	VICE-PRESIDENT.
WM. R. TODD,	SECRETARY AND TREASURER.
W. A. O. PAUL,	ASST. SECRETARY AND TREASURER.

Mine Office, HANCOCK, HOUGHTON COUNTY, MICHIGAN.

SAMUEL B. HARRIS,	AGENT.
E. D. JOHNSON,	CLERK.
THOMAS WHITTLE,	MINING CAPTAIN.

LAKE SUPERIOR COPPER PRODUCTION.

As per compilation of U. S. Geological Survey, the production of Lake Superior copper was as follows:

Year.	Pounds.
1887	76,028,697
1888	86,472,034
1889	88,175,675
1890	101,410,277
1891	114,222,709
1892	123,198,460
1893	112,605,078
1894	114,308,870
1895	129,330,749
1896	143,524,069

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REORGANIZED APRIL 3, 1887.

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D. L. DEMMON, ... *Treasurer.*
GRAHAM POPE, ... *Manager.*

Directors:

THOS. H. PERKINS, O. D. ASHLEY,
R. E. DEMMON, D. L. DEMMON,
GRAHAM POPE, of Michigan.

Mine located at
HOUGHTON COUNTY, MICHIGAN.

DIVIDENDS BY COPPER MINING COMPANIES.

Company.	Shares.	Par.	Issued Capital.	Dividends paid in 1896.	Total declared or paid dividends to Nov. 30, 1897.
Anaconda	1,200,000	$25	$30,000,000	$2,250,000	*$3,750,000
Atlantic	40,000	25	1,000,000	....	740,000
Boston & Montana	150,000	25	3,750,000	1,500,000	6,275,000
Butte & Boston	200,000	10	2,000,000	....	....
Calumet & Hecla	100,000	25	2,500,000	2,500,000	50,850,000
Centennial	80,000	25	2,000,000	....	....
Central	20,000	25	500,000	....	1,970,000
Franklin	40,000	25	1,000,000	....	1,280,000
Kearsarge	50,000	25	1,250,000	....	160 000
Old Dominion	150,000	25	3,750,000	....	....
Osceola	50,000	25	1,250,000	125,000	2,222,500
Quincy	100,000	25	2,500,000	1,000,000	9,470,000
Tamarack	60,000	25	1,500,000	360,000	5,190,000
Tamarack, Jr.	40,000	25	1,000,000	....	....
Wolverine	60,000	25	1,500,000	....	....

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*To June 30, 1897.

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PRODUCTION OF COPPER IN ARIZONA.

The output of copper in Arizona, as per Government figures, was as follows:

Year.	Pounds.
1882	17,984,415
1883	23,874,963
1884	26,734,345
1885	22,706,366
1886	15,657,035
1887	17,720,462
1888	31,797,300
1889	31,586,185
1890	34,796,689
1891	39,873,279
1892	38,436,099
1893	43,902,824
1894	44,514,894
1895	47,953,553
1896	72,934,927

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⁂

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⁂

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IN TONS FINE.

1896.	1895.	1894.	1893.	1892.
135,856	119,941	125,009	129,832	134,371

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Copper Department in Charge of Brainerd T. Judkins, for Ten Years Editor and Proprietor of the *Portage Lake Mining Gazette*.

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HIGHEST AND LOWEST PRICE OF LAKE SUPERIOR COPPER DURING THE FOLLOWING YEARS.

IN CENTS PER POUND.

	1896.	1895.	1894.	1893.	1892.	1891.
Highest..........	12.00	12.25	10.25	12.50	12.37½	15.00
Lowest...........	9.75	9.35	9.00	9.62½	10.50	10.25

	1890.	1889.	1888.	1887.	1886.	1885.
Highest	17.25	17.50	17.70	18.10	12.12½	11.87½
Lowest...........	14.00	11.00	16.00	9.95	10.00	9.80

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CONDUCTIVITY OF COPPER.

Matthiessen's figures for relative conducting power are as follows:

Silver	100
Hard or unannealed copper	99.95
Soft or annealed copper	102.21

Rolled Copper has specific gravity of 8.93. One cubic foot weighs $558\frac{125}{1000}$ pounds. One square foot, of one inch thick, weighs $46\frac{51}{100}$ pounds.

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PRODUCTION OF COPPER IN MONTANA.

Year.	Pounds.
1882	9,058,284
1883	24,664,346
1884	43,093,054
1885	67,797,864
1886	57,611,621
1887	78,699,677
1888	97,897,968
1889	98,222,444
1890	112,980,896
1891	112,063,320
1892	163,206,128
1893	155,209,133
1894	186,310,472
1895	201,093,992
1896	232,096,483

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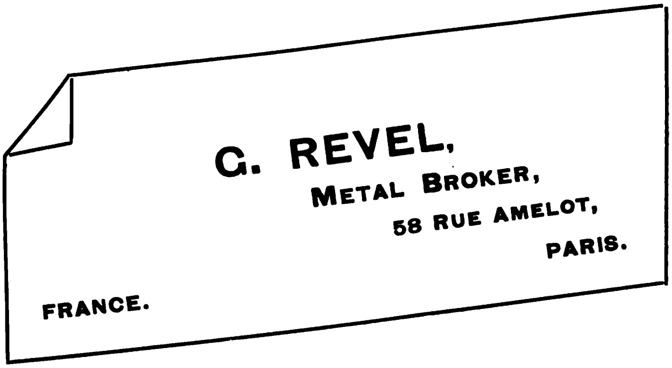

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FRANCE.

COPPER STATISTICS.

	Year 1896. Tons.	Year 1895. Tons.	Year 1894. Tons.
U. S. Production	203,894	171,067	159,623
European "	86,396	86,178	88,531
U. S. Exports	125,605	64,722	77,131

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